evoted to
EXTILE
HEMISTRY
EACHING
DYEING
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AMERICAN

DYESTUFF REPORTER

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ND COLORISTS

Partners in Brown

Solophenyl* Brown G L (*Golden shade*) joins Solophenyl Brown R L (*Reddish shade*) to give the dyehouse a variety of true Direct Browns possessing the extreme in light fastness and washing.

Mills producing fabrics requiring the ultimate in light resistance, either on Cotton or Rayon will find these Browns to be ideally suited.

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*Reg. U. S. Pat. Office.

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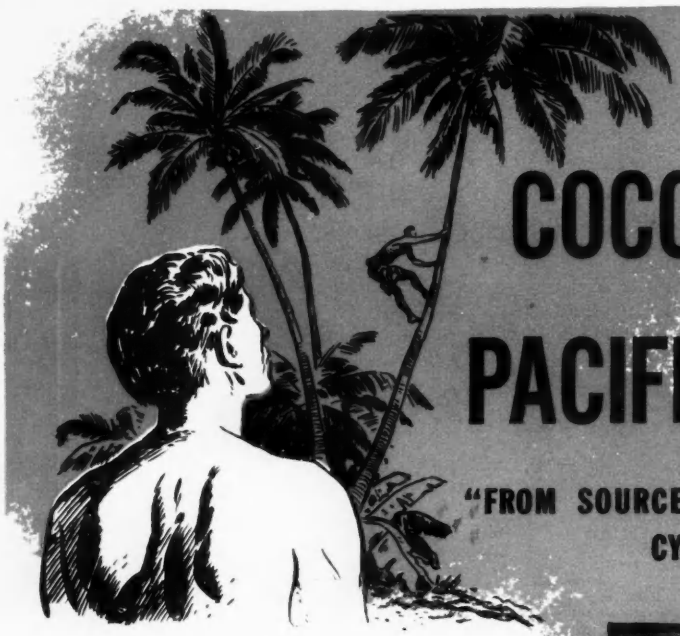

COCOANUT OIL
FROM THE
PACIFIC ISLANDS

**"FROM SOURCE THROUGH SULPHONATION—
CYANAMID CONTROLS THE QUALITY"**

Uniform results can be obtained in processing textiles with sulphonated oils only if the oils are carefully selected for uniformity and sulphonated under rigid control. That is why Cyanamid has taken great pains to establish reliable sources of supply throughout the world for all the various oils . . . and equipped its plants with the most modern sulphonating facilities. Cyanamid's cocoanut oil, for example, was obtained and will again be obtained from sources long recognized for their reliability in the Pacific Islands. In addition, they are subject to critical analysis on arrival. This selectiveness, together with Cyanamid's large scale, precision controlled equipment, provides Cyanamid customers with a completely dependable source of supply for sulphonated oils, upon which they can plan confidently. Look to Cyanamid for:

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Olive Oil	Castor Oil
Tea Seed Oil	Red Oil
Cocoanut Oil	Peanut Oil
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Rape Seed Oil	Cottonseed Oil
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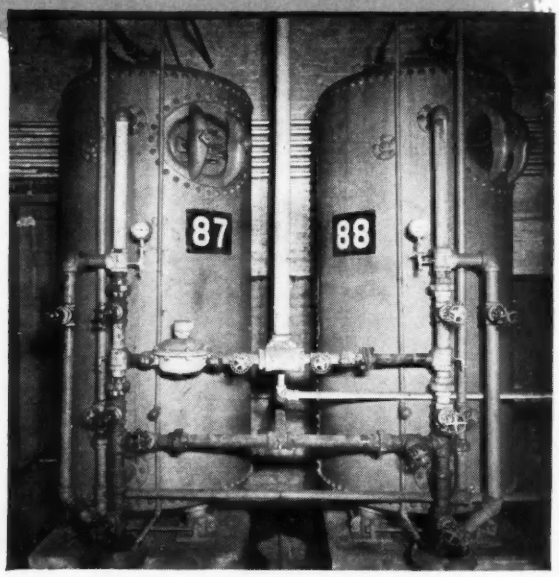

Water is essential to most chemical producing processes. Above is one of the large-capacity water purification units installed in a Cyanamid textile chemical producing plant.

AMONG CYANAMID PRODUCTS FOR THE TEXTILE INDUSTRY ARE...

**Penetrants • Softeners • Finishes
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American CYANAMID & Chemical Corporation

(A UNIT OF AMERICAN CYANAMID COMPANY)

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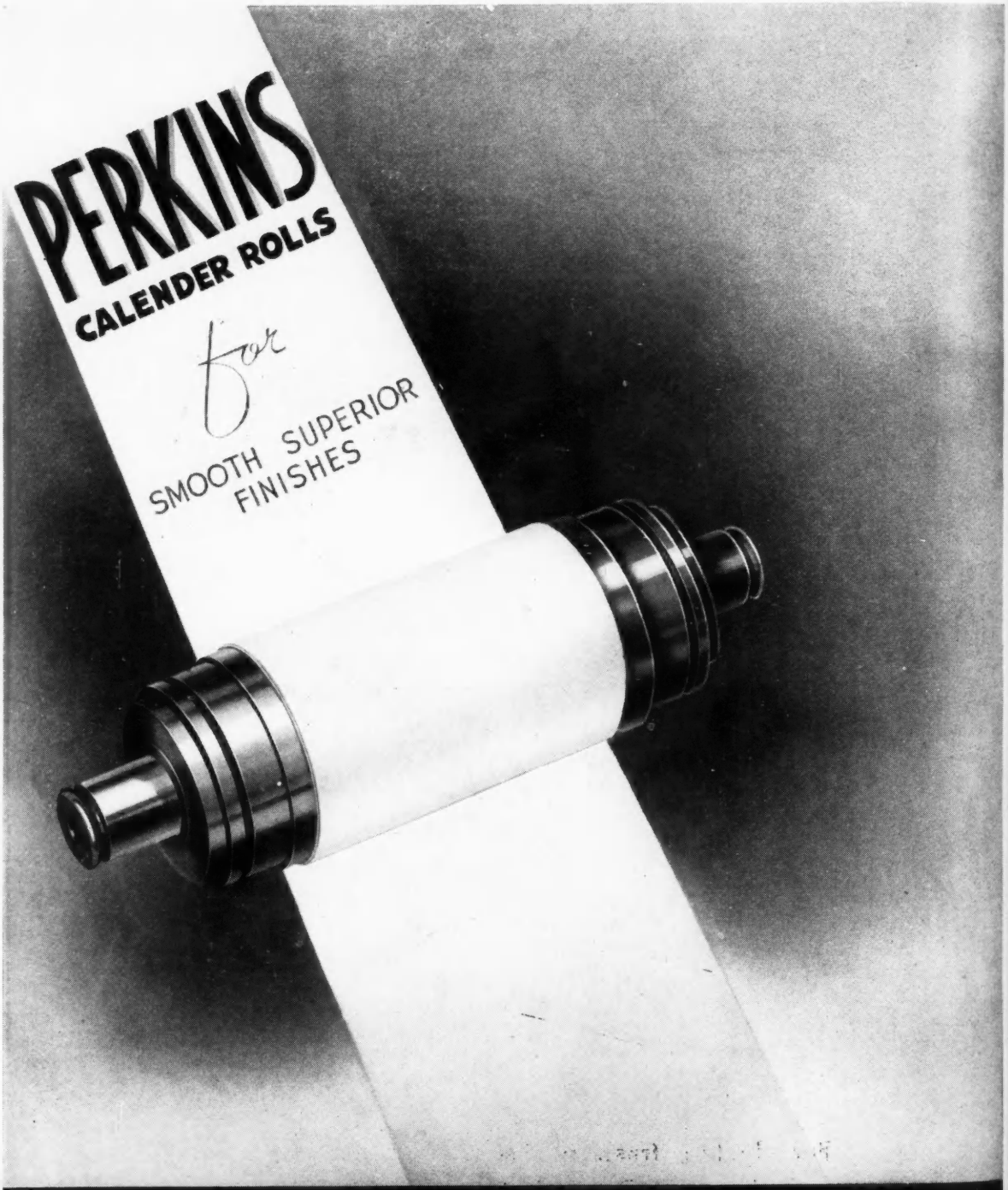

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PROTECT ACETATE COLORS from GAS & FUME FADING

Velvamine GF is a blend of amines and softeners designed to protect acetate colors from gas or fume fading. It resists removal by drycleaning and, when used on mixed fabrics, has a minimum effect on the shade and light fastness of the direct colors Velvamine GF produces a soft, full hand and does not affect the appearance of the treated fabrics.

Velvamine GF is compatible with resins, gelatine, glue, starches, dullers and similar finishing compounds.

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IN RESINS! Glycerine is an important component in the making of alkyd resins, used for automotive finishes and for finishes on refrigerators, stoves, and other home appliances, because it is efficient and high-boiling, and offers complete availability of all three of its hydroxyl groups. Pictured above is a depth gauge used to measure the thickness of paint.

What's News In Chemistry?

—Glycerine!

GLYCERINE, known for generations to chemists, is still something new, something exciting in its possibilities, both for products for human consumption and for use in industry.

Glycerine is chemically stable under ordinary conditions, and by proper choice of conditions many other useful chemicals can be made from it.

For instance, glycerine is an important component of alkyd resins, used in making protective coatings and in processing textiles. It is used in making ester gum, an important constituent of varnishes.

It is one of the basic materials used in making monoglycerides, employed in shortening and margarines. And it is used in making polyglycerols, which are higher-boiling, more viscous glycerine-like substances useful in the manufacture of some of the resins.

Because of its many advantages, so many manufacturers desire glycerine for so many purposes that this versatile material is more in demand than ever before.

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IN DRUGS AND COSMETICS! Glycerine has been a known and trusted standby for generations in the making of pharmaceuticals. It is also a material that offers ever-new possibilities.

IN FOODS AND CONFECTIONS! U.S.P. glycerine, pure, sweet, and wholesome, is a valuable ingredient in itself—and also offers advantages in the derivatives that can be made from it.

IN TEXTILES! Glycerine is used in dye baths, printing pastes, and spray-dye solutions employed in coloring and printing many types of textiles. The use of glycerine-derived alkyd resins in the textile field is growing.

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SULFRAMIN DT POWDER*

In a world that grows cleaner day by day, textile mills are depending more and more upon the chemical magic of Sulframin DT. For Sulframin DT is an unusually efficient detergent; and is very economical besides.

Chemically classified as an alkylaminosulphate, Sulframin DT functions effectively in almost every phase of boiling off and drying procedure. As an emulsifier and foaming agent it performs ideally; it dissolves readily and blossoms into rich suds even when diluted by ten thousand parts of water. Equally important, the efficiency of Sulframin DT isn't lessened when used in hard water.

Moreover, Sulframin DT is unaffected by the presence of lime and magnesium salts; it resists both acids and alkalies; and even after long storage, it does not deteriorate. Sulframin contains no soap; consequently rancidity and stains —so common when soap is used as the emulsifier —no longer present a textile problem. And in the dyeing industry concerned with processing rayons and acetates, the thorough dispersing qualities of Sulframin DT are utilized to particular advantage.

If you require more detailed information, phone or write!

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OTHER ULTRA CHEMICAL PRODUCT DEVELOPMENTS: SULFRAMIN DT PASTE • SULFRAMIN DR PASTE
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FOR PROTECTION
AGAINST GAS FADING

Neufume, an Onyx product of sterling merit, is used by leading finishers with most excellent results, to protect acetate rayon against gas fading. Neufume eliminates department and retail store losses caused by the gas fading of garments and piece goods.

- Economical to apply.
- Does not dull or change fabric color.
- Non-corrosive.
- Applied during finishing operation.
- Used by leading finishers.

It will pay you to investigate Neufume.
Write for samples and demonstration.

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when beauty calls for science

use SOLVAY
TRADE MARK REG. U. S. PAT. OFF.
SODIUM NITRITE

CAPTIVATING COLOR IS THE RESULT of quality dyes and dyeing. For developing azo dyes, well-known finishing houses use SOLVAY Sodium Nitrite. It is their guarantee of a *quality* result . . . a *better* result for cotton, rayon, silk . . . color fastness at minimum cost. A QUICK LOOK AT SOLVAY Sodium Nitrite shows you why it is superior. This U.S.P. Grade is a fine powder whose crystals tend to remain unusually free-flowing. Shipped in convenient-to-handle 425-pound barrels. Specify quality . . . specify SOLVAY.

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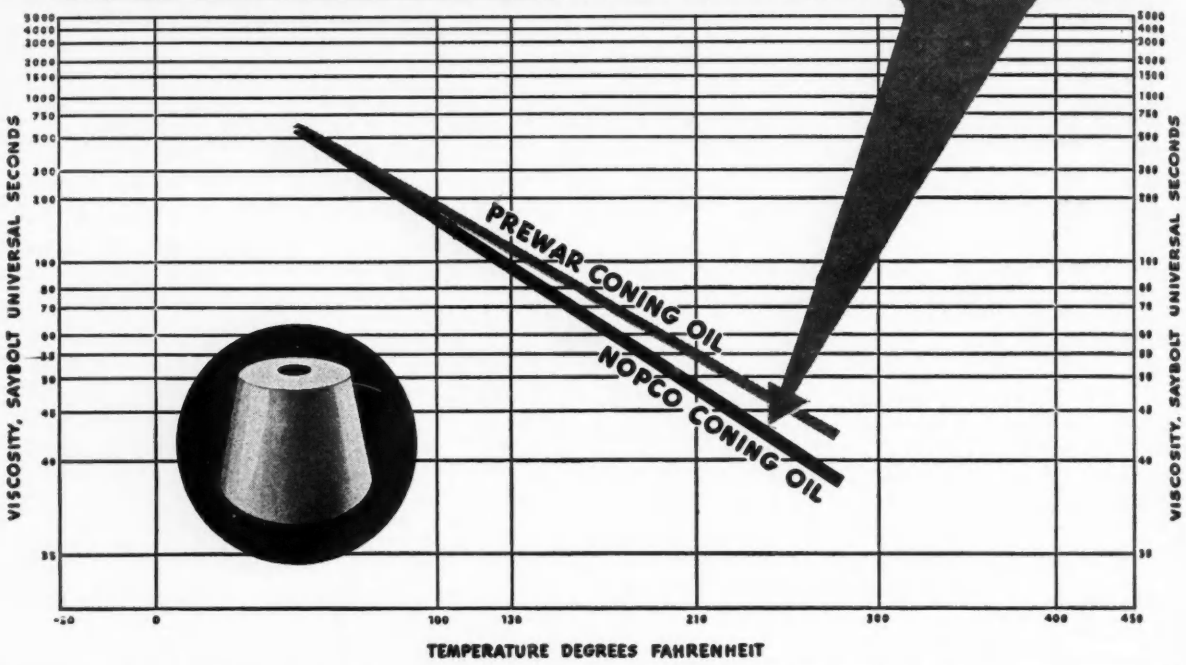
specify Quality . . . specify SOLVAY

THE ANSWER TO BETTER NYLON CONING AND KNITTING . . . NOPCO NYLON CONING OIL



As the graph shows, NOPCO Nylon Coning Oil has a *viscosity* of 175-180 seconds—the same as that of *pre-war* nylon coning oil.

Other advantages of this outstanding nylon yarn lubricant are . . .

TENACITY. Nopco Nylon Coning Oil—*a superior bonding material*—tends to hold the oil on nylon sized yarn. Flaking is minimized, adequate and lasting yarn lubrication assured.

INSOLUBILITY. Nopco Nylon Coning Oil does not form an emulsion—does not lose lubricating effectiveness as it passes through the water trough of the knitting machine.

YARN PROTECTION. With essential lubrication maintained throughout the coning process—with flaking minimized in knitting—good stitch formation and snag resistance are assured. Thus Nopco Nylon Coning Oil provides an extremely valuable aid in keeping product volume and quality up and production costs down.

"BOOM DAYS" for nylon lie ahead. Competition will be keen. It will pay you to give your nylon yarn the protection of a dependable coning oil such as Nopco. For further particulars write address below:

NATIONAL OIL PRODUCTS CO., HARRISON, N. J.
Branches: BOSTON, CHICAGO, CEDARTOWN, GA., RICHMOND, CALIF.

NOPCO CONING OIL
FOR NYLON YARN PROTECTION

NOPCO EVOLVED THROUGH RESEARCH
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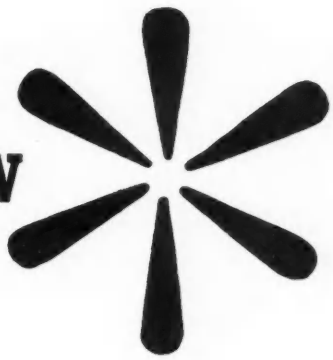
Eastman Black SN New



Eastman Black SN New **is a highly refined soluble dye base. Diazotized and developed with beta-oxy naphthoic acid, it dyes acetate rayon dense greenish shades of black which retain their cast under both daylight and artificial light.**

When heated with direct steam, Black SN New will not tar in a water medium. It is highly recommended for cross dyeing since it stains viscose rayon and cotton only slightly. At low temperatures, it penetrates and levels well with good exhaustion of the dyestuff. Blacks obtained with this dye by either jig or box method meet general commercial fastness requirements and offer exceptional resistance to sublimation and crocking.

Eastman Acetate Dyestuffs are available in a wide variety of useful colors which have been especially developed for cellulose acetate rayon. For additional information on these dyestuffs and their application to synthetic fibers, write to TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

EASTMAN ACETATE DYESTUFFS

The Element of Quality Is In Every Hooker Chemical

THERE'S a plus value for you in every Hooker Chemical. This is mighty important to you who are trying to maintain or improve quality of your product. That value is *dependable, uniform quality*. You can be sure that every shipment of Hooker Chemicals will be of the same high purity that meets your requirements. Uniform chemical supplies preclude the necessity of making costly adjustments in your process.

Listed below are some of the Hooker chemicals that are helping dye and textile chemists maintain uninterrupted production. Technical data sheets giving chemical and physical properties and analyses are available when requested on your letterhead.

Our Technical Staff is also ready to assist you in evaluating Hooker chemicals for your particular purposes.

Product (Chemical Formula Molecular Weight)	*Hooker Specifications*	*Suggested Uses*
Benzoyl Chloride C_6H_5COCl; 140.5	Freezing Point.....–0.9°C Min.	Manufacture of benzophenone, benzyl benzoates, synthetic perfumes, dyes and pharmaceuticals. In Friedel-Crafts reactions.
Benzyl Chloride (Omegachlortoluene) $C_6H_5CH_2Cl$; 126.5	Boiling Range 5° including .....179.4°C	Manufacture of ethyl benzyl aniline, dyestuffs, intermediates.
Cyclohexanol (Hexahydrophenol) $C_6H_{11}OH$; 100.1	Cyclohexanol (High Grade) ..98% Min. Distillation Range.....100% 4° C Max.	Solvent for dyes. Chemical intermediate.
Metanitrobenzoyl Chloride $NO_2C_6H_4COCl$; 185.5	Last crystal point.....28 to 31°C	Manufacture of dyes.
Orthodichlorbenzene $C_6H_4Cl_2$; 147	Freezing Point.....–10 to –22°C Boiling Range 6° including.....179°C	Manufacture of pyrocatechin, dye intermediate, other synthetic organic chemicals. Degreasing wool.
Paranitrobenzoyl Chloride $NO_2C_6H_4COCl$; 185.5	Minimum Purity.....95% Melting Point..... 70°C Min.	Manufacture of dyes.
Sodium Sulfhydrate NaSH; 56.1	NaSH .....70 to 72% Na_2S.....1 to 2% NaOH.....0% NaCl.....1% Max. Na_2SO_3, NaHCO .....1% Max. Fe.....5 ppm Max. Cu, Ni, Cr, Mn, Pb .....1 ppm Max. Water of crystallization.....28 to 26%	Desulfurizing rayon; calico printing; in sulfur dye baths.
Sodium Sulfide Na_2S; 78.1	Na_2S.....60 to 62% NaCl.....1.5% Max. Other Na Salts.....2.0% Max. Fe.....10 to 15 ppm Cu, Ni, Cr, Mn, Pb .....1 ppm Max. Water of crystallization ....36.5 to 34%	Desulfurizing rayon; calico printing; in sulfur dye baths.
Sodium Tetrasulfide (Solution) Na_2S_4; 174.23	Na_2S_4 .....40% Min. Other Sodium Salts.....1.0% Max.	Manufacture of sulfur dyes.

HOOKER ELECTROCHEMICAL COMPANY

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HOOKER CHEMICALS

Caustic Soda **Chlorine** **Muriatic Acid**
Bleaching Powder **Paradichlorbenzene**

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National Aniline stands ready
with every class of aniline
dye and color to produce
an unvarying color match.
For many, many years we have
served all textile centers here
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where color is used.
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"TESTED"

FOR SOFT, FULL HAND AND EXQUISITE
DRAPING QUALITY ON COTTONS AND RAYONS

SOLUBLE LUXOLENE

(a "Drew Tested" synthesized finishing oil)

is unsurpassed

One of a complete line of textile chemical auxiliaries it will pay you to investigate

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SMITH-DRUM...

....OFFERS THE ONLY

SPECIFICALLY DESIGNED TO HANDLE YA

HERE, FOR THE FIRST TIME, is a completely integrated system especially designed for preparing, dyeing, extracting and drying yarn in package form. Each machine is the result of extensive research and experimentation to develop the best design for the specific purpose of handling packages . . . to eliminate the disadvantages of other types of machines and to provide many *new* advantages. This system results in faster, more uniform work . . . cuts costs . . . reduces labor.

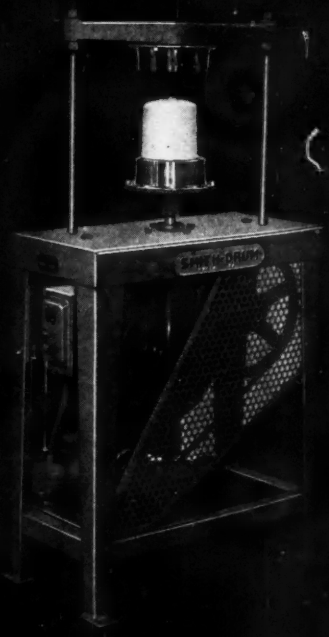
FORMULATING . . . This machine dyes a single package and is designed for laboratory use in determining the approximate formula to be used in the larger batch machine. It provides more accurate control of the formula, because the sample is dyed under exactly the same conditions as the complete ba

FORMING . . . This machine properly prepares the package for dyeing by crimping the edges of the package to aid penetration of the dye liquor at that point.

DYEING . . . This machine, introduced by Smith-Drum several years ago, has completely revolutionized package dyeing. An entirely new type of package carrier and a radical departure in spindle design reduces resistance to flow, providing much greater flow of liquor through each package than the conventional types of machines. This greatly in-

FORMULATING

FORMING



Complete System

YARN IN PACKAGE FORM

creases the speed of dyeing and improves uniformity of results.

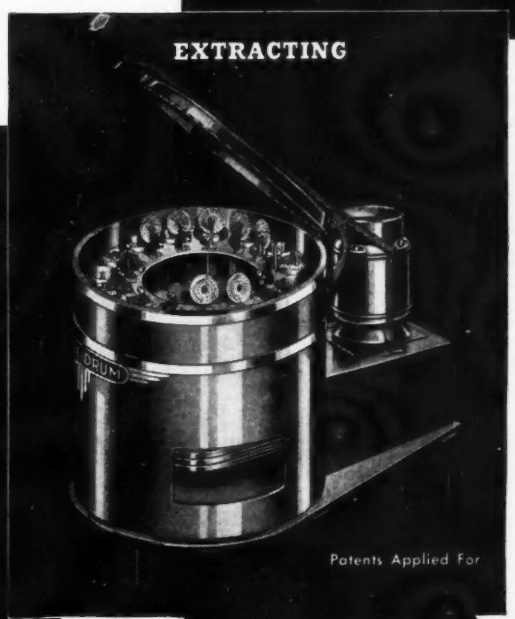
EXTRACTING . . . This brand new Smith-Drum machine reduces moisture content to *42% in 70 seconds running time!* This means a big saving in both steam and electricity in the drying process. It also reduces labor costs by simplifying loading and unloading so that even a girl can operate it. Complete cycle, including loading and unloading, is only 2 minutes. The machine also reshapes the package and prevents crushing of dye tubes.

DRYING . . . Another new Smith-Drum development, employing a new principle in package drying. Cuts drying time as much as 75% . . . saves up to ½¢ per pound of yarn! It uses less electricity . . . prevents migration of color . . . eliminates salt deposits. Yarn is delivered in better condition because of short drying cycle. Drying is more uniform than by other methods.

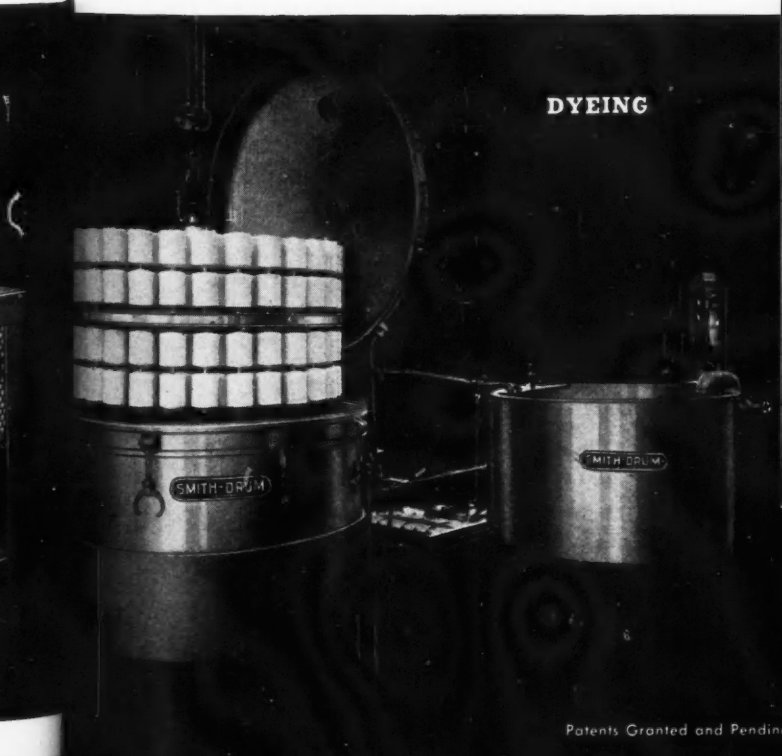
Complete information on any or all of these machines will be sent to you promptly upon request.

SMITH, DRUM & COMPANY
Allegheny Ave. at 5th St., Philadelphia 33, Pa.

Patents Granted and Pending



Patents Applied For



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AMCO CHEMICAL CORPORATION

70 LISTER AVENUE • NEWARK 5, NEW JERSEY

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ALKYL SULFATES

• Why worry about Sulfonated Castor Oil? Our ALKYL SULFATES are made entirely from DOMESTIC raw materials — are readily available—and are SUPERIOR in every way to Sulfonated Castor Oil!

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HARD WATER DETERGENCY
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INSTANT WETTING OUT
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AMCO-EST

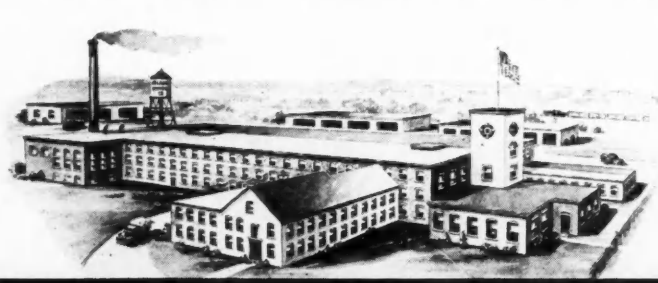
ATCOSYN

OUR NEW SYNTHETIC DETERGENT IN POWDER FORM

Textile processors: We'd like to introduce our new arrival to you . . . ATCOSYN . . . an aryl alkyl amide sulfonate. We'd like to show you how it cleans really CLEAN in any and all cleansing, scouring and rinsing operations on wool, cotton, rayon and other synthetics.

ATCOSYN is stable to salt, hypochlorate, chlorine, peroxide, alkaline and acid solutions and to all types of hard water.

Send us a sample of your fabric to be ATCOSYN processed — or ask for an actual mill-demonstration by ATCO technicians.



Use ATCO Products

ATLANTIC CHEMICAL COMPANY

MAIN PLANT, CENTREDALE, R. I. • BRANCH OFFICE, PATERSON, N. J.

S/V Woolrex Oils Scour Out Easily With Minimum Amounts of Soap!

With S/V Woolrex Oils on all your stock, you can be sure of simple, easy, economical scouring.

The amount of soap solution you apply here, in the fulling mill, normally is sufficient to insure satisfactory scouring in the washer.

This can mean substantial saving in both fulling and scouring time and costs.

And this is just one of the many Woolrex Oil benefits. For these famous oils penetrate and spread throughout your stock to give you uniform conditioning and lubrication.

Yarn strength is increased. "Ends down" are reduced to a minimum. Freedom from gum-forming tendencies assures long card runs before stripping.

Get S/V Woolrex Oils now for greater, more efficient wool production and lower processing expense.

Process Products
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INVESTIGATE
SOCONY-VACUUM
PROCESS PRODUCTS
Research and Service

Better, Lower-Cost PROCESSING for ALL Textiles

WOOLENS
S/V Woolrex Oils

Improve carding and spinning. Scour out easily.

★

WORSTEDS
S/V Worstex Oils

Lubricate stock uniformly, improve spinning.

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WATER REPELLENTS
S/V Fabrisecs

Give inexpensive water repellency.

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FINISHING
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Plasticize starch mixtures.

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Insure quick, uniform re-wetting during sanforized processes.

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Lubricate, soften and deluster rayon fibers.

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Special Oils, Waxes

Provide waterproofing, lubrication and softening.

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S/V Copper-Naphthenates

Prevent fungus growth and increase fabric life.

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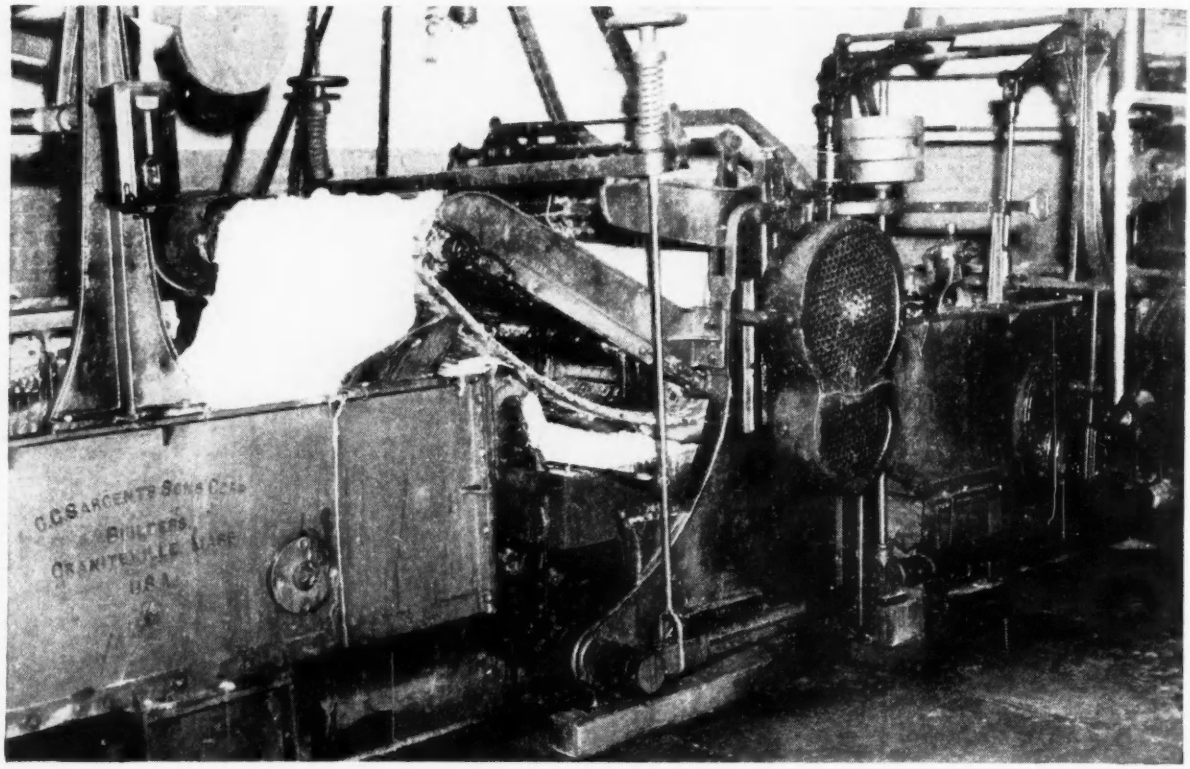


The bottleneck that lime built

AND CALGON* BROKE

PRODUCTION IN THIS TEXTILE PLANT moved smoothly at wartime speed—except in the dye room. There it seemed impossible to reduce the amount of rehandling, to cut the percentage of rejections. Too many pieces would not take color well.

The plant chemist finally located the trouble. Fabric went into the dye room carrying a residue of sticky and insoluble soap. The cause—lime salts in the raw wool, lime salts in the water used for scouring.

Using Calgon in the scouring process ended the difficulty, for Calgon sequesters metallic ions in the form of soluble complexes, thus giving water of zero hardness.

Textile plants use Calgon in the wool carbonizing bath also, where a very small proportion prevents the formation of calcium sulphate sludge or scale. Used in the dye bath, Calgon inhibits the effect of metals dulling the shade. Threshold treatment of plant water supply with Calgon (2 to 10 parts per million) inhibits corrosion.

Because of these and other properties, Calgon has dozens of important applications in all textile plants. For detailed information, write for Technical Bulletin No. 3, "*Calgon Data for the Textile Chemist.*" We will be glad to send you a copy.

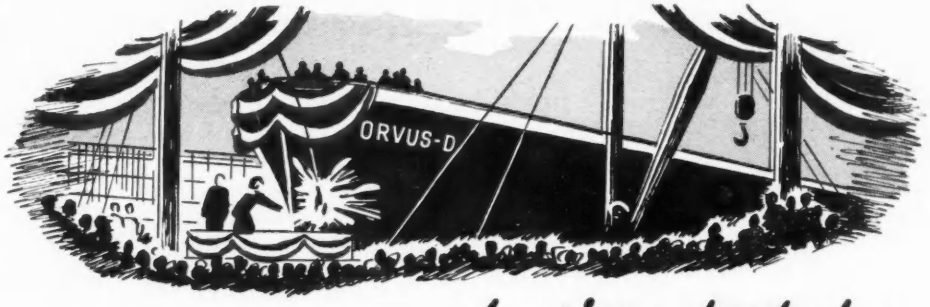
* *T.M. Reg. U.S. Pat. Off.*

HAGAN HALL BUROMIN CALGON

calgon, inc.

A SUBSIDIARY OF HAGAN CORPORATION

HAGAN BUILDING PITTSBURGH 30, PA.



We've Re-christened a time-tested product

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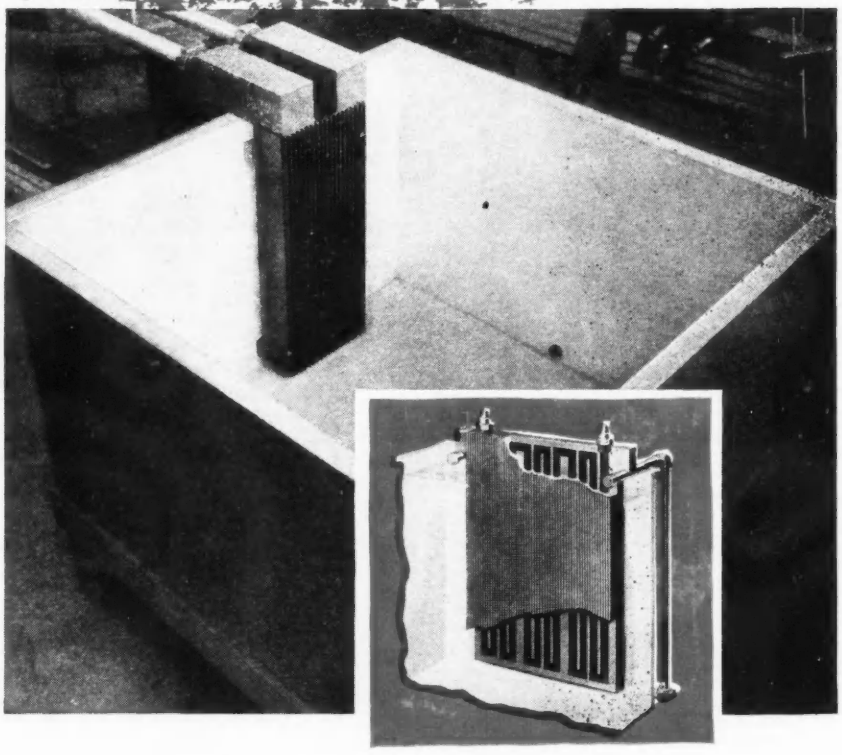

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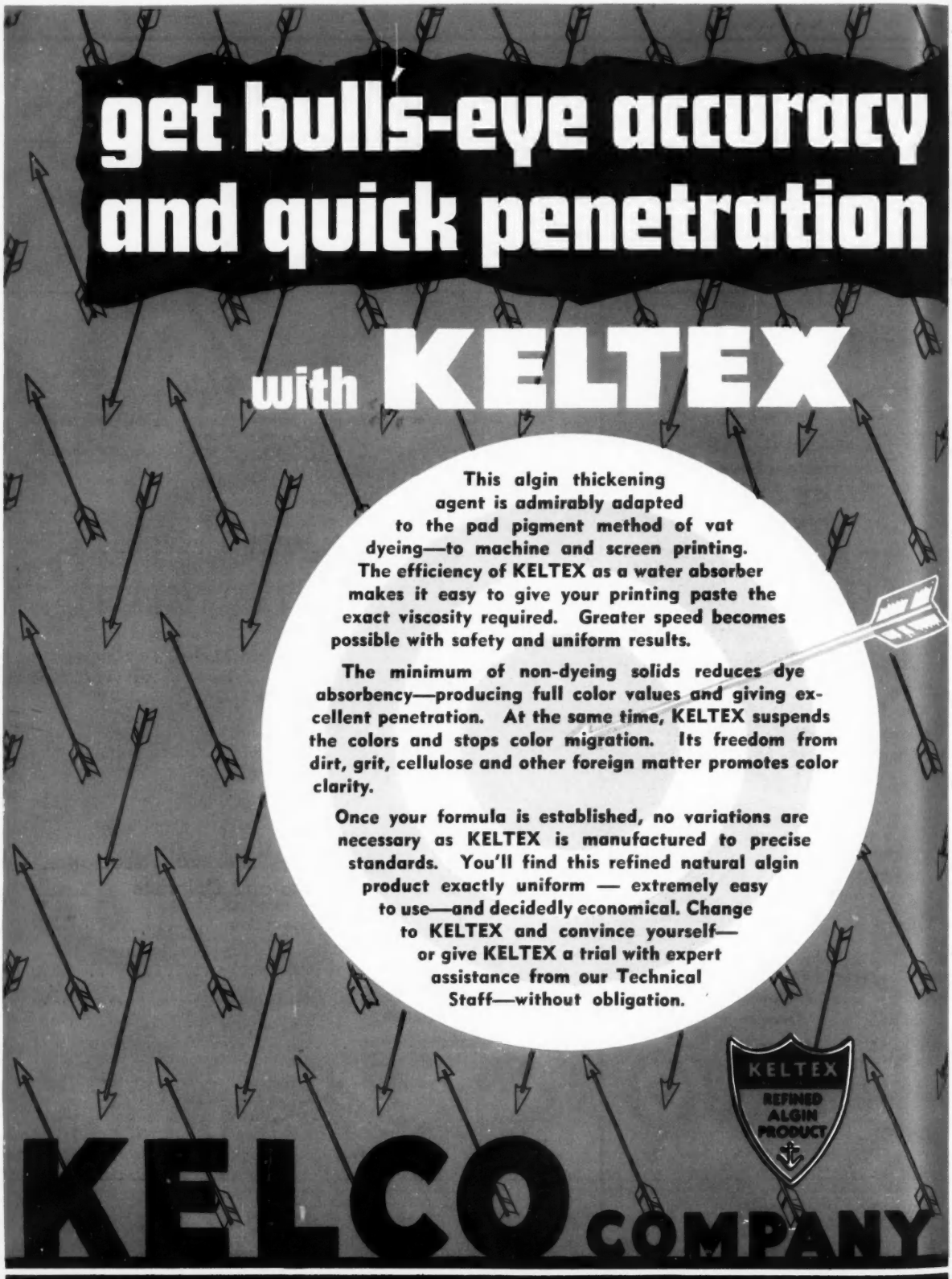
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SILVER ANNIVERSARY CONVENTION

THE Silver Anniversary Convention of the American Association of Textile Chemists and Colorists has been awarded to the Northern New England Section and will be held in Boston on December 12, 13 and 14, 1946, with headquarters at the Hotel Statler.

George O. Linberg, E. I. duPont de Nemours & Co., Inc. is General Chairman, assisted by an Executive Committee of Edward S. Chapin, W. C. Durfee Company, Inc., Walter J. Hamburger, Fabric Research Laboratories, Inc., Harry M. Hartnett, General Dyestuff Corporation, Azel W. Mack, Dexter Chemical Corporation, Delbert E. Ray, Massachusetts Mohair Plush Company, Lowell, Mass., and Hyman P. Selya, Sagamore Color & Chemical Company.

At the first executive committee meeting elaborate plans were made, appropriate to the nature of the Northern New England Section, to assure a successful Convention. Additional plans and committees will be announced later.

Peacetime Applications of

WAR DEVELOPMENTS IN TEXTILES

Victory Convention, Hotel Pennsylvania, New York City, January 4, 1946

THE session convened at 9:45 o'clock, Kenneth H. Barnard, National Chairman of the Technical Program presiding.

Chairman Barnard: In the technical sessions today we have tried to cover the subjects of most timely interest to the greatest number of our members by experts in their respective fields who not only know their subjects, but also know how to present them to you. Only one program is scheduled at a time, so that all of you can hear everything.

The central theme of this morning's session is "Peacetime Applications of War Developments in Textiles." As this will be discussed from many angles, each speaker is allowed only a very limited time. However, after each speaker has presented his paper I am going to ask him to step outside so that those who are particularly interested in his subject can talk it over with him at their leisure.

Our first speaker this morning is one whom you have all heard before and are always glad to hear again. As director of the Standards Department of the American Viscose Company for many years, he is an outstanding authority on his subject, and it is now our pleasure to hear from him again.

Dr. Bonnet! (Applause).

Dr. F. Bonnet: Mr. Chairman, Ladies and Gentlemen: I was a little embarrassed and didn't know what the Chairman meant when he said that when a speaker is finished he steps outside. (Laughter.) But I think he has explained that, and I am not as worried as I was when he first made the statement.

I always have to help myself out by having samples, so people will stay to hear what I have to say. My subject is "Developments in Viscose Rayon."

. . . Thereupon Dr. Bonnet presented his prepared paper.

DEVELOPMENTS IN VISCOSE RAYON

DR. F. BONNET

Director, Standards Dept., American Viscose Corp.

LAST year (1944) some 724 million pounds of rayon were produced in this country which is almost twice as much as was produced in 1939 at the beginning of the war. This production includes, of course, viscose, acetate, and cuprammonium rayon; both as continuous filament yarn and as staple. The largest single factor in this increase in production was the government program for 240 million pounds of viscose rayon tire yarn for our armed forces. The pressure which was put upon the rayon industry to increase strong yarn production was tremendous so that the production of ordinary yarns for civilian use was curtailed to a minimum. Every available machine that could possibly be used was pressed into service. This often meant higher production costs for such equipment had not been designed primarily for strong yarn production. It must be remembered that high strength, tough rayon yarns, suitable for tires, cargo 'chutes, cords, tapes, etc. require special viscose solutions, special precipitating baths, and particularly special handling in order that the straight chain molecular structure of the cellulose would become oriented while still in the plastic state. It is not enough to produce merely very strong yarn for tires with low extensibility for such yarns tends to be brittle and tire yarns must all be tough to withstand the everlasting flexing action to which they are subjected during service. High strength must be associated with suitable extensibility for the toughness required. However, some very strong yarns have been produced with low extensibility and because of their static strength have found some use in plastic laminates and similar developments.

Rayon tire yarns had, of course, been used in bus and heavy duty truck tires quite a number of years before the war with rather phenomenal success, but it was not until some time after Pearl Harbor that the armed forces began demanding an ever increasing production of tire yarn. The 240 million pound government tire yarn program was well on its way when the war was over and for the first nine months of 1945 some 137 million pounds were produced as compared to 76 million pounds for the same period in 1944, and only 9 million for twelve months in 1939.

The pressure for tire yarn was also due to the fact that the high strength tough rayon cords gave not only longer tire life but required less rubber. For example, a 10.00x22 12 ply bomber tire weighs 128.9 pounds and uses 25.3 pounds of cotton cord, whereas the same tire using rayon cord with greater strength weighs only 118.8 pounds and uses only 19.6 pounds of rayon cord. It has been estimated that by using rayon cords for the armed forces some 87 million pounds or 43,500 tons of very critical rubber were saved during the war.

But all this is merely mentioned to give a sketchy background of the greatest single development in viscose rayon production during the war years. Although the process of making strong rayon yarns was well known before the war, the pressure of war production and expansion has doubtless put the industry ahead in this field by about ten years, and much was learned about the process so that specialized machines can now be designed for more economical and competitive operation.

For tire yarn production the size of the filament was around 2 1/3 denier. The general information gained in spin-

ning the strong and regular yarns led directly to the development of semi-strong continuous filament yarns with much finer filaments of only 1 denier per filament. Such fine multifilament yarns as, for example, 100 denier with 100 filaments or 75 denier with 75 filaments, has made it possible to produce many new and attractive fabrics whose characteristics are quite different from those using the pre-war type of rayon with heavier filaments and the future fabric developments using these yarns alone or in combination with others looks very bright and interesting.

With the making of these stronger yarns there has been a gain not only in the dry and wet strengths but the wet strength loss has been less. Thus, while ordinary viscose rayon has a strength of about 2 grams per denier dry and 1 gram per denier wet, the newer types of strong yarns will run about 3 grams per denier dry and 2 grams per denier wet. a loss of only 1/3 the dry strength instead of ½.

There have often been comments about this rather high loss in the wet strength of rayons but curiously enough this seems to be equally true of steel for according to two Swedish metallurgists, Benedicks and Ruban (Jernkontorets Annaler Vol. 29, 149 p. 37-106) carefully hardened and tempered steel (0.83C .16 Si 0.34 Mn) showed a loss of some 22% of its dry strength when tested wet. In ethyl alcohol this loss was even greater some 27%. On the other hand, when tested in hexane, benzene, kerosene, there was a gain in strength anywhere from 12 to 27%. Glass also loses strength when tested wet and it is a well known fact that it "cuts" easier under water because its shearing strength is less. Glass fabrics are also more easily abraded while wet than when dry. Fatigue testing showed lower results both for steel and glass when tested wet.

Just as tough tire yarns had originally been developed before the war, hosiery yarns made of strong viscose rayon had also been developed, had in fact gone through the testing and trial period and were just about to be introduced to the trade when the war stopped all further production of this yarn for civilian use. This kind of yarn was then too urgently needed for the armed forces and could not be spared for women's hosiery.

The rayon industry was quite aware of the fact that the ordinary type of rayon was unsuited for the purpose. It was most unfortunate, therefore, that these stronger types of rayon could not have been used for stockings when silk and nylon became war casualties for hosiery. That the strong type of viscose rayon was well adapted for women's hosiery may perhaps be illustrated by a recent request for analysis of some stockings sent to our Standards Department. It seems these particular stockings had been purchased in Mexico at rather a high, in fact, exorbiant price as "nylons." The New England wearer of these stockings accepted them as "nylons" and was so enthusiastic about them that she wanted, if possible, to identify the brand so she could get "some more just like them" incidentally stating she had never liked rayon stockings. Analysis showed that the stockings were not nylon at all but viscose type rayon 50 denier 18 filament "Tenasco." These stockings were obviously from some of the pre-war experimental lots. How they got to Mexico to be sold as "nylons" was, of course, not disclosed but, in any case, it must be admitted no matter what the prejudice may be about rayon hosiery these stockings made of semi-strong rayon must have been good to give such consumer satisfaction.

The regenerated cellulose types of rayon have a fairly high moisture absorption, which is more than cotton, acetate rayon, wool, nylon or "Vinyon," the "Vinyon" fiber having practically no moisture absorption at all. This relatively high moisture absorption is very good when the fibers as yarn and fabric are to be used for diapers and similar absorptive uses, but is not so good in ladies' stockings. Again the greater percent of moisture in such rayons as compared to cotton under the same conditions makes rayon pile and brushed fabrics less flammable and, therefore, less dangerous than corresponding fabrics made of cotton, however, since such rayons take up more moisture than the other fibers just mentioned it also takes longer to dry the rayon.

Curiously enough there is but little difference in the moisture absorption between regular and the stronger type of viscose rayon even though the latter has a much higher wet strength and shows a smaller proportional wet strength loss. When viscose and other regenerated cellulose types of rayon absorb water the fibers swell and in this swollen condition are more easily abraded than when dry. This swelling with the absorption of water has been the subject of considerable investigation and it is obvious that to lessen this water absorption and corresponding swelling implies some basic changes in molecular structure.

Two treatments for fabrics which are still in the initial stages of production development have given considerable promise. Thus a comparison after forty launderings and folded ironings of many kinds of test fabrics treated and untreated seems to indicate that while the untreated fabrics all showed unsatisfactory shrinkage and wear, and some were even severed at the ironing fold, the treated samples showed less than 1% shrinkage and little if any wear at the ironing fold. Incidentally the treatments also seemed to increase the dye absorption and improve the levelness of shade. What effect such treatments may have on the strong viscose type rayon for hosiery, for example, has not as yet been determined.

Since under the government rayon tire yarn program there has been such an increase in strong yarn production it is probable that in the immediate post war period not all of this production will be consumed in tires.

Various uses for these heavy 1100 to 2200 denier yarns have already been found, for example, in carpet backs. This is just one of the secondary war developments for finding civilian uses for war material. In the carpet industry jute and other base fiber yarns have generally been used in the backing, but these stronger rayon yarns of heavy overall denier seem to give greater enonomy in operation and a more uniform and more serviceable backing. Other uses for such heavy yarns have been for upholstery, linings, garments for rough wear and various industrial fabrics of the canvas type like covering for light weight air travel luggage, and their use in plastic laminates have already been mentioned.

Rayon staple developments have gone on apace although greatly handicapped by war time restrictions and cut backs of spindles running rayon. However the expansion of rayon staple production, particularly viscose staple, in the near future promises to be extensive. The versatility of the fibers, and the yarns and fabrics made from them, seem limitless. There may be bright and dull fibers, short or long or varied lengths, fibers of different deniers simultaneously spun and thus blended at the viscose spinning machine. To these great variations must be added the possibilities of spun dyed staple and it is easy to understand why there seems to be no end to the possible variety of uses of spun rayon fibers alone or in combination with other fibers.

But developments and improvements in the production of rayon and rayon staple do not progress by themselves alone. They are naturally associated with developments in other industries. Thus apparel, drapery fabrics and household furnishings require colors which are fast to light and washing and the vat and other

fast colors are necessary to really increase the large potential uses for rayon in this field. Although these fast colors cost more than the ordinary direct colors the main difficulty has been the much higher cost of application, but experimental machanies like the Williams ager type reducing unit, developed by the General Dyestuff Corporation, or the multiple lap type unit developed by duPont engineers and similar types of equipment have already clearly demonstrated that in the very near future when stainless steel and other materials again become available it will be possible to dye fabrics with the best light-and-wash-fast colors at a cost no greater than the present cost of dyeing with direct colors.

However it is not enough that upholstery and other fabrics exposed more or less to strong sunlight should be light and wash fast. Such fabrics must also be stable fabrics which do no excessively shrink nor sag if they are to give consumer satisfaction. Two treatments have already been referred to which seem inherently to change or modify the cellulosic structure and to greatly lessen moisture absorption within the fiber. There is a third method which has also been employed to reduce shrinkage and to stabilize fabrics, namely the application of resin finishes. Some of these resin treatments have been quite satisfactory but some have not because of their tendency to retain chlorine from the ordinary laundry bleaching operation. For example, a shirt made of a fabric stabilized with such a resin and going through the regular laundry procedure will retain chlorine from the bleaching process, and the subsequent hot forming or shaping of the shirt results in the weakening if not total disintegration of the fabric. The remedy is indeed very simple requiring the laundry merely to give an after-wash with a very inexpensive and simple anti-chlor solution to neutralize such retained harmful chlorine. If the use of an anti-chlor wash were to become common standard practice with laundries, it would go a long way to giving longer life not only to the rayon fabrics stabilized with chlorine retentive resins but to all other fabrics which are currently chlorine bleached without the benefit of an anti-chlor.

A new development in the use of rayon staple made essentially of production of a thermo sealing tea bag paper made essentially of strong viscose staple with sufficient "Vinyon" staple to give it thermo plastic heat sealing properties. The use of "Vinyon" greatly simplifies the operation of sealing the bags and has been found to be much more satisfactory than any other materials which have been tried. It is, of course, of particular importance that such tea bag paper cannot contain anything which in any way will affect the delicate aroma or taste of the tea, and it is interesting to record that this combination of viscose rayon and "Vinyon" staples for tea bag paper has successfully passed the severest tests of official tea tasters.

One of the war uses of rayon staple was in blood filters. It was also used for the solar still absorption medium and various types of rayon wicks. Because of its softness and freedom from lint large yardages of soft spun rayon fabrics were used for cleaning lenses, reflectors, and other optical equipment.

Then there is the strong type of rayon staple which was very successfully used in blends of 20% rayon staple and 80% asbestos for spinning asbestos yarns for fire fighting clothing. There are so many uses to which spun rayon is being put that it is difficult to name even the important ones. Treated to make it water repellent and resilient it is finding use as pillow stuffing which is of particular interest to those who are allergic to feathers. In the coarser filament sizes it has found some use in upholstery stuffiing. Even baseballs have been made with spun rayon cord. On the other hand. 1 denier per filament rayon staple has been spun into very fine yarns for handkerchiefs of great softness and delicate texture. Blended with fur hair some interesting fabrics have come on to the market. These have some 70 or 80% rayon staple blended with fur hair and cotton, and are remarkably soft, warm and appealing.

Mention has been made that to lessen the moisture absorption and swelling of rayon involved changes in molecular structure. A certain change or addition to the molecular structure is also required to make viscose rayon susceptible to being dyed with wool dyes. This has been worked out by Courtauld chemists in England and the product is called Rayolanda. The cellulose structure may be considered a sort of a hat rack whose properties are modified chemically by hanging various nitrogen reactive groups on various pegs. By introducing such groups through reactions with cyanamide, the cellulose molecule becomes activated for the absorption of wool dyes. Such molecular modifications of the cellulose still further increases the number of new products based on rayon staple.

In thus very briefly describing some few developments in viscose rayon it must be clear that there is hardly a limit to the wide variety of uses to which it can be put, and the large increase in production which is being undertaken shows the faith the producers have for a bright and interesting future for rayon.

* * *

. . . Dr. Bonnet concluded his paper as follows:

I would like, if I have just a moment, to show you a few samples. I have here a pair of socks which you will find are very soft and very woolly. These are the materials that are made with some of this fur, about 80 per cent. And here is some fabric of the same kind. I believe the fabric is termed Natura.

I have here some fabrics that are 100 denier, 100 filament. Here is some 75-75 filament fabric. Here is some neck ruching. Then I also have various samples of fabric using directly some of the tire cord. I might say this was not made of first-quality tire cord, because that had to go to the government, but you will see this is the type of material used in various constructions for these uses.

I have here also some toweling, which is rather interesting, being a combination of linen, cotton, linen flax and rayon.

In closing I do want to say a word about a matter that has been talked about a great deal, and about the information there has been about it in one of the magazines recently, namely, the making of unwoven fabrics, fabrics which simply make use of the combed out nap of cotton or other fibers, and then it is sprayed with the resin in a suitable way and brought together, which gives what is called an unwoven fabric.

Here is a fabric that looks like the paper used for cleaning lenses and here is another type. Here is one that is made more attractive, perhaps by having fibers of plasticized cellulose acetate.

Chairman Barnard: We next turn from viscose to acetate fibers, and we are fortunate in having persuaded one of the greatest experts in the field to discuss it here.

Besides 15 years activities in the A.A.T.C.C., he is an honorary life member of the American Association of Textile Technologists and the Textile Institute of England. He is a member of the Advisory Board of the Quartermaster for Textile Research, and past president of the Textile Research Institute. All of us welcome our guest speaker. It is a pleasure to present Dr. Harold DeWitt Smith, treasurer and textile technologist of A. M. Tenney Associates.

Dr. Smith! (Applause.)

. . . Dr. Smith presented his paper as follows . . .

* * *

ACETATE RAYON

HAROLD DeWITT SMITH

Treasurer and Textile Technologist, A. M. Tenney Associates, Inc.

ALTHOUGH the military uses of acetate rayon were not as extensive nor as spectacular (with one or two exceptions) as those of some of the other other manufactured fibers, a review of the dozen or more wartime uses to which acetate filament yarn or staple fiber were put shows that this branch of the textile industry played a significant part in the war and reveals several areas in which the peacetime application of these developments will expand.

Acetate rayon was used in some items, such as tow-targets, lint-free wiping cloths, and navy neckerchiefs, as a simple substitute to relieve the shortage of, or to make up for the absence of, other fibers. Its use in another group of items, such as officers' summer clothing, and work-clothes—particularly for women war-workers—was dictated, not by any one particular outstanding property as compared to other fibers, but, rather, by its general versatility and by the combination of crease-resistance, dimensional stability, and attractive appearance obtainable in well designed acetate rayon clothing fabrics.

A third group of wartime uses in which some specific distinctive property of acetate rayon dictated its choice is the most interesting from the standpoint of this discussion. Such uses include fluorescent signal panels, fused-edge tapes, electrical insulation, and mildew resistant fabrics.

Acetate rayon was selected for the signal panels used for the color identification of vehicles, air-strips, beach landing-points, etcetera, because of its specific affinity for the fluorescent dyes which make these panels superior to textiles colored with any other type of dye with respect to visibility, especially in the half-light of dawn or dusk. The fabric is a heavy, filament acetate satin, resin-coated after dyeing for protection and ease in cleaning. Except for theatrical decoration and costumes, it is unlikely that fluorescent-dyed acetate fabrics will be of any importance in the civilian textile market.

The thermoplasticity of acetate rayon had already been utilized in the pre-war development of a method of making tapes and ribbons by slitting broad-woven acetate rayon fabrics and heat-sealing the edges to prevent raveling. During the war, this technique was used to make a variety of acetate rayon tapes for bindings and for electrical purposes. The economic advantage of making tapes and ribbons from broad goods by this method is too obvious to need stressing. There are already indications that the large-scale commercial experience gained during the war will result in a great variety and volume of fused-edge, acetate rayon tapes and ribbons for gift wrappings, blanket bindings, dress and millinery ribbons, and for industrial tapes in many weights, thicknesses and textures.

The superior electrical resistivity of acetate rayon resulted in a wartime consumption for this purpose which was given less publicty than most of the other applications of manufactured fibers. This development, like that of the fused-edge ribbons, was founded on research dating from long before the start of hostilities. The spun tussah silk which was formerly considered essential for certain types of telephone central office wires has been completely replaced by filament acetate rayon, the performance of which, with respect to insulation and ageing properties, will almost certainly retain its position in this field.

Large quantities of other kinds of instrument wire were insulated with acetate rayon. The swelling and solubility of acetate rayon in selected solvents has been used to seal, or bond, the filaments after winding on the wires with a resulting increase in abrasion resistance.

Large quantities of filament acetate rayon tapes were used for winding field and armature coils of electrical motors. The improvement in the electrical efficiency of such motors is due in part to the high insulation value of the acetate itself and in part to the improvement in the space factor because of the thinness of the filament acetate fabric.

Military operations in the South Pacific, in area in which high temperature and high relative humidity promote the rapid growth of organisms which mildew and rot cellulosic and protein materials, focused attention on the inherent mildew resistance of acetate rayon. Laboratory tests with the various species of mildew organisms and actual soil burial tests have repeatedly confirmed that acetate rayon is rot-proof, that is, its strength is not significantly affected under conditions of mildew attack which deteriorate or destroy cellulosic fibers, leather, etc.

Inasmuch as spun acetate and filament fabrics have already demonstrated their utility and attractiveness in warm-weather clothing for men, women, and children because of the wrinkle resistance and the dimensional stability, in wear and in laundering, of properly constructed acetate rayon summer clothing fabrics, this additional property of inherent resistance to mildew deterioration should insure a widening market for civilian fabrics for apparel and household uses in southern climates which are generally characterized by high temperatures and high humidities.

Four special types of acetate rayon are worthy of mention in a discussion of wartime uses and peacetime potentialities:

One is a saponified acetate rayon characterized by very fine filaments and a combination of very high strength and rather low elongation. This was produced commercially during the war for flare chute and other purposes for which a very high strength-to-weight ratio was desirable.

Another is a high impact, or high elongation, acetate rayon characterized by normal strength and a breaking elongation about twice that of ordinary acetate rayon. This was produced commercially during the war for aerial delivery chutes for which a high work of rupture per unit weight was desirable.

Another special type which was in the experimental stage was a medium tenacity acetate rayon with strength in the neighborhood of 2.5 g/den. This was of interest for tropical insect netting because of the fortunate combination of strength and mildew resistance.

The fourth special type, which has been in commercial production since before the war, is plasticized acetate staple fiber which is used to make felts and bonded webs of various weights and textures by subjecting a batt composed of a blend of plasticized acetate staple with other plastic or non-plastic fibers to heat and pressure.

These special types offer interesting possibilities for the postwar textile industry to use acetate rayon in new ways.

Apart from the ways in which wartime applications of acetate rayon may stimulate designers of fabrics for ap-

parel, household and industrial uses to employ the distinctive properties of acetate rayon in suitable fabrics, an extensive attack on the problem of improving the fastness of dyed acetate rayons has been carried to success during the war years. The results of some of this work are displayed in the technical exhibits of your Committee on Atmospheric Fading at this Convention. This Committee has revised the test procedure and markedly raised the standards of fume fastness. Its exhibit, which merits your careful examination, includes a few examples of inexcusably inferior resistance and a number of commercial dyeings of lining fabrics, dress fabrics, and suiting fabrics whose resistance to fume-fading is excellent. These results have not been achieved by any miraculous product or process, but by the sound application of commercially available dyes, protective agents, and procedures, with little or no special equipment. For each type of fabric, the general fastness properties essential for the end-use of the fabric have been kept in mind. For example, the men's suiting colors will withstand 60 or more fadeometer hours, and, after washing at 105° F or drycleaning, the high resistance to fume fading is retained. The high-shade women's lining fabrics will withstand several A.A.T.C.C. units of fume fading. The high-style dress shades will withstand 10 to 20 fadeometer hours and two units of fume fading.

In addition to the proper choice and application of acetate dyes, the war years have introduced new methods of applying dyes which were not previously used on acetate rayon. One of these, which is included in the fume fading committee's exhibit, involves the practical application of vat dyes to acetate rayon fabrics with resultant fastness to light, to washing at 160°F., and to fumes, comparable to the results obtainable with vat dyes on viscose and cotton. Another is the dyeing of acetate piece goods with acid dyes by a solvent swelling method.

This brief review of the technical status of acetate rayon as illuminated by the developments of the war years indicates that its normal growth as a versatile textile fiber will be materially accelerated by the intelligent use of acetate rayon for some of its distinctive properties, such as thermoplasticity, electrical resistivity, and mildew resistance, and by the marked technical improvements which have been achieved in color fastness.

* * *

Chairman Barnard: I am very sorry to announce that the talk on nylon has been canceled.

The newest things in fibers or finishes cannot progress very far until their properties and characteristics can be measured. Our next speaker has spent most of his life in advancing the science of textile testing, by teaching, by lectures, by writing books and technical articles, and by his own research work as director of the Slater Memorial Laboratory. For over ten years he has been a member of this Society.

We extend a cordial welcome to an old friend, Professor E. R. Schwarz, of the Massachusetts Institute of Technology.

* * *

Professor Schwarz! (Applause.)

NOTE: At the time that this issue went to press, Professor Schwarz' paper was not ready for publication. It will appear in the next issue. Ed.

* * *

Chairman Barnard: For the past four years textile research has passed through a one-way door marked QM. Today this door has become a partially revolving door, and the man who knows the most about the new developments in textile finishing as head of the Chemical Section, Office of Quartermaster General, is ready to talk to us on the subject "The Quartermaster Fights the Weather."

I take pleasure in introducing Mr. William Lee. (Applause.)

. . . Thereupon Mr. Lee presented his prepared paper. . . .

THE QUARTERMASTER FIGHTS THE WEATHER

WILLIAM M. LEE

Chief, Chemical Section, Office of the Quartermaster General

THE title which Mr. Barnard suggested for this paper, "The Quartermaster Fights the Weather," allows me freedom to discuss, if I were able, almost any of the some 70,000 items and parts which the Quartermaster supplied during the war; for problems of weather and weathering entered into the planning of most of the new items of supply and equipment of this war, and the reviewing of most of the old ones. I must, however, simplify the assignment to two topics—tentage, and water resistant clothing—and talk about these in a general qualitative way, only.

In talking about the weather, it is useful to include several phenomena which are not direct manifestations. Weather, in the usual sense, results from the interplay of varying conditions of temperature, humidity, light, wind, rain, snow and ice.

But in planning the design of an item for long time outdoor use, we should think of certain other effects as well—alkaline dusts, salt spray, blown sand and even mildew. It goes without saying that sometime in the course of the development of any end item for military use, thought must be given to all of these effects. We must consider first how well an item will serve its functions under particular climatic effects, and second, how this performance will be affected by long time exposure to these climatic conditions.

Here are a few of the extreme and less pleasant effects which our troops have encountered:

In the Persian Gulf—daytime air temperatures up to 120° in the shade.

On sections of the Alcan Highway—temperatures down to minus 50° or 60°.

In the Aleutians—the infamous williwaw, a freak wind which appears to blow in all directions at once, at speeds up to 120 miles per hour. It carries sharp gravel particles which will cut a tarpaulin to pieces in a few hours.

In the Philippines—rain forests where, despite the fact that deciduous trees shed seven crops of leaves per year, the ground is bare of any leaf mould. Bacteria and molds keep it reduced to slime.

In many islands of the Pacific—coral rock which cuts shoe soles like knives on edge.

In parts of New Guinea—rainfall up to 400 inches per year, and there are numerous records of 20 inches in 24 hours.

On the other hand, there are a good many exaggerations to be heard. Shoes do not rot and fall apart in 48 hours. Tents do not mildew into shreds in a week; even when the cotton is unprotected by fungicides.

The performance characteristics of tentage have, one time or another, occupied the attention of a good many of us here. Quartermaster Corps procurements of finished duck for tentage and tarpaulins for a time ran a little over thirty-five million

yards a month. A procurement program of this size justifies a certain amount of worrying about performance.

Immediately prior to the war, the decision was made that Army tentage should be flame resistant. On the basis of negative evidence, this appears to have been a wise decision. We have not received any reports of large scale damage to tents by fire, and what is much more important, no reports of deaths or injuries resulting from burning tents. It is always difficult to appraise negative evidence. If we had not flameproofed tents, we might still have had no serious tent burning problem for, as it developed, incendiary warfare was practiced against cities and industrial targets rather than military installations. On the other hand, almost all tents received by salvage depots for repair showed one or several small burned or charred spots, and it seems a fair assumption that many of these would have been wholly destroyed had they not been flameproofed.

In the decision to adopt flameproofing, we faced the necessity of accepting a considerable increase in weight, of the general order of 50 percent, and a decrease in cold flexibility. But by the use of a resinous finish we also had a means of providing a dark olive drab shade by pigmentation. The program could not have been accomplished with any of the sunfast dyes nor by mineral dyeing. We gained an advantage, in some cases dubious, of improved rainproofness. I think that this advantage was not very important with the better grades of duck, but was considerable with some of the loosely woven flat ducks which had to be utilized through a part of the program.

Mildewproofing agents were also incorporated into the finish so that it served quite successfully one additional function.

The evaluation of fire, water, weather and mildew resistant duck has been a difficult and rather unsatisfactory problem. With the customary clarity of vision, associated with hindsight, we feel that we now know what evaluation studies should have been carried on before the war. As things actually happened, the problem of evaluation of tentage was approached obliquely. A study of the relationship of outdoor exposure to accelerated test methods was undertaken early in 1942 by the Textile Foundation under the direction of Dr. Harris. This investigation selected tentage as one of several items for study. As has happened many times before, a program initiated to study methods, was presently forced to become a study of items. The program which was to have studied some of the relationships between accelerated laboratory test methods and the weather, became instead a study of factors affecting the performance of tentage. Much of the work done has, however, had direct and valuable application to the original problem. The work on this program is still continuing at the Milton Harris Associates, the Jeffersonville Quartermaster Depot, and the Quartermaster Board at Camp Lee. It has lead us to one unavoidable conclusion; we cannot predict with any degree of exactitude the general outdoor performance of flameproofed tentage from any series of laboratory tests which are practicable to run repeatedly. This is not a very happy conclusion, particularly when one considers that the finishes supplied by the fifteen or twenty contractors were fundamentally very similar. They were not specified by formula and therefore differed in minor details. All of them consisted basically of chlorinated paraffin, antimony oxide, calcium carbonate, carbon black, yellow and red iron oxides, and toward the latter end of the program, copper naphthenate as a mildewproofing agent. The differences lay in the proportions of these ingredients, in the additional resins and plasticizers selected, and in the methods of application and drying. With these relatively minor differences, it was still not possible to rate the performance of manufacturers A, B, and C in an order based on laboratory tests, and have this order hold in outdoor use.

Had we closed our eyes to diversities of climate, the situation might have seemed more comprehensible. Unfortunately for our peace of mind, exposures were carried out at Indio, California, or just across the state line at Yuma, Arizona; at Miami, Florida; at New Orleans; at Washington; and at Jeffersonville, Indiana. When exposures in these various locations could not rate performance of various finishes in the same order, there was obviously very little possibility of getting a clear prediction of over-all performance from laboratory tests.

This point, I believe, needs all the emphasis we can properly give to it. These graphs represent loss of warp tensile strength against time—one very important aspect of tent performance. Graph No. I shows a single type of tentage duck exposed for a period of one year at Yuma, New Orleans and Miami. It is reasonabiy accurate to say that the most important cause of degradation at Yuma was sunlight, and that one of the most important causes at New Orleans was mildew. In all of the locations, however, a number of causes must must have contributed to the total effect.

Graph No. II shows a second type of tentage duck exposed at the same three locations over the same period. It must be borne in mind that the basic fabric for these two samples was identical—12.29 oz. plied yarn duck taken from the same mill run. It must also be remembered that the finishes, although not identical, were very similar in composition and in the method of application. Which of these two duck samples is to be rated as preferable? We do not know. Each of the exposure locations reported a type of climate in which the Army expected to use tentage. If actual evaluation by exposure gives such contradictory ratings as these, then how can we look to the laboratory for a representation of weather which will give a clear prediction of outdoor performance.

Perhaps there is an answer to that. Perhaps our present apparent confusion lies in the fact that the formulations for finishing tentage are still too far from ideal; that, for instance, we have not provided a large enough margin of safety for protection against sunlight nor enough margin of safety in resistance to mildew. When our technical knowledge in these matters has advanced further, it may be that we shall create finishes for cotton which will be outstandingly good against *all* of the direct and indirect attacks of weather. When this has been accomplished, such an outstanding finish should rate high whatever the location of exposure, and, in all probability, laboratory test methods will indicate this with perfect clarity.

At the present time, the Quartermaster Corps has erected at Camp Lee, a large number of slightly simplified experimental tents. These incorporate numerous experimental finishes, experimental fabrics, and certain experimental constructions. Erected within a few yards of these tents, are exposure frames from which samples can be taken periodically to determine the rate at which the effects of weathering are taking place. The tents themselves will stand for a period of one year, and will then be dissected to study the total effects. This set-up provides us also with a means to determine whether the exposure panel gives a complete story of weathering. It is not, of course, subject to the varying stresses which a tent receives; and it does not reach temperatures as high as some of the fabric incorporated into a tent.

In the meantime, the weather at Camp Lee is being studied and recorded with an accuracy not heretofore applied to the problem. The total radiation from the sky is measured continuously in three bands—infra-red plus visible; visible plus near ultra violet; ultra violet. Rainfall is accurately and continuously measured. Continuous curves of temperature and humidity are recorded. Wind velocity and wind direction are measured frequently. When this program is finished, we shall,

first and foremost, have a number of very practical answers about the real performance of fabrics and constructions which now can only be approximated. In addition, we shall have a very accurate knowledge of the total weather effects which occurred at Camp Lee for a period of a year. We shall know the total number of inches of rain that fell and such additional factors as, for instance, the total number of hours during which the tentage was wet. We shall know the total amount of ultra violet which fell on the tentage over a year; the total number of times that wet canvas froze and thawed again, and so on.

Now what is to be done with these findings? The interim measurements which can be made on the panels and the final measurements which can be made on the tents, are quite limited. The loss in tensile strength can be measured. The extent of degradation can be determined by cuprammonium fluidity. Water permeability can be redetermined, and flame and char resistance.

The measurements which can be applied to these fabrics are, however, simply measurements of a summation of effects. It cannot be hoped that the data derived will in any way indicate how much of the total damage was the effect of sunlight; how much was the effect of weathering and driving snow; how much the effect of heat. The Camp Lee program must be considered, therefore, as a first part of a larger investigation; and the larger investigation must include two phases: first, the accurate recording of the various factors of weather in a number of typical climatic areas—Panama perhaps and Alaska, the American desert and the South Atlantic coast line. With these various sets of weather data, one can then presume to predict, with some degree of accuracy, the relative importance of each component of weather within a typical climate. The second phase then goes back to the laboratory for the study of each of these effects, isolated and applied to tentage in measured doses.

To say isolated is to be guilty of over simplification. It cannot be assumed that infra-red radiation alone will produce the same effect upon cotton as infra-red radiation in combination with periodic wetting. We can, however, face up to the not wholly impossible problem of studying single effects and fairly simple combinations of effects. The laboratory is far more capable of studying such synthetic systems than of creating circumstances which will simulate weather. That is the principal point I want to make. We cannot simulate anything as various as weather. We can try to simulate one phase of weather at a time, and we can estimate how important this phase is in the total effect of weather in any given geographic locality.

In this matter of relating laboratory evaluations to exposure performance, I should like to remark on a distortion which appears repeatedly in the presentation of data. Graph No. III represents the loss in warp tensile strength of an actual tentage fabric during one year's exposure at Miami and at New Orleans. Superimposed on this graph, and represented by the light line, is the rate of loss of warp tensile strength during accelerated weathering under the carbon arc. Observe how well the accelerated test predicts the performance at Miami.

Graph No. IV shows the same fabric exposed at the same locations. The light line again represents accelerated weathering. It now appears to predict quite accurately the performance at New Orleans but fails with respect to Miami. The only difference, of course, in Graphs III and IV is in the linear values assigned for hours of accelerated weathering.

This should be obvious enough. Actually it is too often forgotten that, in superimposing such graphs, the linear values are wholly arbitrary and any fairly straight line relation may be made to appear to coincide with any other.

Prediction of immediate effects of rainfall is one of the most interesting problems which the Quartermaster and its research agencies have studied. In this field, there has been more progress made in the evaluation of clothing and items of equipage than in the evaluation of tentage. There are, however, several rather interesting points that can be made concerning the penetrability of tentage by rain. The first is in the matter of evaluating a grey duck for its suitability to be finished as tentage. Mr. Henry A. Rutherford, of Milton Harris Associates, has carried out a study on this point, with this significant conclusion; water penetration of grey duck under a hydrostatic head of eight inches is not interpretable. Variation in the natural water repellency of the yarns influences the hydrostatic penetration value so much that the rate of penetration ceases to be a function of the geometry of the fabric. But the subseqeunt finishing of the fabric completely destroys or obscures this natural water repellency so that it plays no significant role in the finished tent. On the other hand, if the hydrostatic head is raised to the order of sixtieen inches, the hydrophobic characteristics of the yarn cease to exert any considerable influence on the rate of penetration; and penetration becomes a good measure of the physical porosity of the fabric.

Hydrostatic penetration, even at the proper height to measure porosity, is still only a comparative test. Fabrics which show very high penetration rates have not showed any leakage whatever in the heaviest rains so far encountered at Camp Lee.

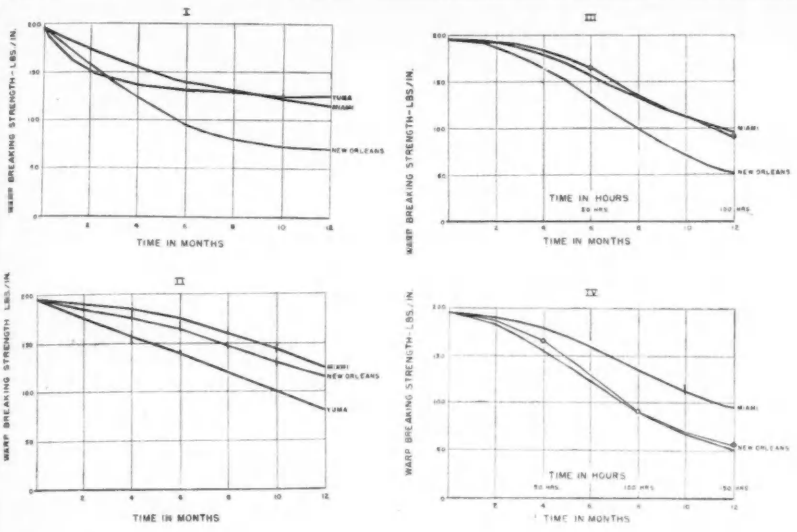
Of considerable interest is the repeated report from various theaters that leaking of tentage occurred only after the fabric had mildewed. Since tentage, in the early days of the war, was finished without a fungicide, a good many tents in the tropics mildewed luxuriantly. This mildew-induced leakage effect has not yet been studied in the laboratory. It is an attractive supposition that the effect is caused by wicking, but neither the mechanism of the effect nor its importance are known at this time.

The problem of improving the performance of tentage against rain was never at any time as critical as the protection of the individual soldier. I cannot hope to cover even in a most cursory way any of the problems of clothing the individual soldier against cold, or of minimizing the imposed heat load of clothing for the tropics. Some of the aspects of protecting him against rain may, however, be mentioned briefly.

The treatment of clothing fabrics to provide water repellency had been studied prior to the war in both England and the United States, and had been well and accurately studied from the standpoint of the civilian user. Even protective garments for the sportsman did not, however, aim to protect the wearer for indefinite periods of exposure to rain nor against exceedingly heavy rainfall. The Quartermaster faced both of these aspects of the problem, as well as a very important third; namely the problem of maintaining water repellency as well as possible under adverse conditions in forward areas, and of restoring it when necessary by relatively simple field treatments.

In order to carry out a meaningful study of any of these, it was first necessary to determine what useful performance we could realistically expect to get from the best possible water repellent garments, and to learn to measure water repellency in terms which could be related to real performance. From industry we had several variations of the spray rating test which, to all appearances, was a highly realistic approach. We had in addition, the Suter height test which seemed less easily interpretable. It was quickly shown that these tests, alone or in combination were inadequate to designate the water repellent characteristics desired in military fabrics. Two new test procedures have been developed during the course of the war.

The research group at Textile Foundation developed a drop penetration procedure which is convincingly realistic, and which has been shown to give results very



similar to gentle rainfall, that is, the terminal velocity of the drop is characteristic of a gentle rain rather than a heavy downpour. The frequency of the impact of a drop against a given spot in the fabric is, on the other hand, much greater than would be encountered in any normal rain, and by this token, the test can be considered an accelerated one. The developers of this test method consider it suitable for differentiating between fair water repellent fabrics and good ones; but not sufficiently sensitive for a differentiation between a number of good fabrics. It has proved very valuable in investigational work.

The drop penetration apparatus provided a proof of the desirability of water repellent construction involving a resilient backing to damp the impact of rain drops; and of the general usefulness of two layer construction, both layers being water repellent. This was subsequently further confirmed by carefully executed wear tests at Camp Lee, Virginia.

Dr. Jack E. Simpson, of the Quartermaster Corps, has contributed the so called dynamic equilibrium test which evaluates another aspect of water repellency. This test comprises, in brief, the measurement of the rate of take-up of liquid water under vigorous mechanical action, i.e., continuous tumbling.

We have then four distinctly different ways to evaluate water repellent fabrics in the laboratory. Two of these—dynamic equilibrium and spray rating—are essentially measurements of the efficiency of the finish and of the finish *only*. Two of them—Suter height and drop penetration —are measurements of the efficiency of the finished fabric; that is, the values obtained in these tests depend not only on the hydrophobicity of the surface but on the porosity of the fabric as well. In addition to these four tests, air permeabilities of the finished fabric are determined. This, of course, is essentially a test of the fabric only, although air permeability values may be slightly altered by the finishing. These tests measure various essential aspects of performance of water repellent clothing in keeping the wearer dry. Using all five tests and interpreting the findings with care and judgment, one is able to predict quite accurately what *initial* performance in the field will be. All five measures do not, however, provide a complete story, for they leave out of consideration the effects of wet abrasion and of repeated stresses which clothing fabrics in use must sustain.

As clothing becomes soiled from mud or dust, body contacts and miscellaneous grime, its water repellency diminishes markedly. On laundering, those fabrics treated with durable water repellents should come back almost, but not quite, to their original performance level.

Tests for acceptance of water repellent fabrics follow this pattern. First: a spray rating which serves as a screening test. Unless the initial spray rating is 90, no further tests are run. Second: one hundred and twenty minutes of wet abrasion. For a number of finishes tested, this procedure reduces the efficiency of the finish about as much as it is reduced during an average half life of a garment, including four to six field launderings. Third: a series of four tests: dynamic equilibrium, spray rating, Suter height, and air permeability.

This procedure of basing acceptance on a performance level after exposure to degradative influences, seems to be gaining in popularity. We are, as another instance, inclined to evaluate mildewproofness after water leaching or after weathering rather than initially.

The acceptance testing for water repellent fabrics is a pretty complicated procedure. It would be far more complicated if we tried to carry out a complete evaluation on each sample. The Quartermaster Corps has, therefore, adopted the policy of carrying out extended evaluation tests on any treatment presented for consideration, and on the basis of these evaluation tests, setting up an approved list of treatments. Routine acceptance from within this approved list can then be carried out by means of simplified laboratory tests. Such acceptance tests may be much more arbitrary than the initial evaluation tests. They need not be quantitatively related to real performance, since it is only necessary that they show the uniformity of production within a previously evaluated quality-of-performance range.

In this field and in others the establishment of an approved list or of an approved formula certified by the manufacturer has been criticized as creating a favored position for certain manufacturers. To this we reply that such approved lists are always open for additions, and evaluations of new products are carried out frequently. On all sorts of items whose usefulness depends upon outdoor durability or resistance to wear, performance testing becomes difficult and frequently very time consuming. There is an increasing trend in Quartermaster Corps procurement operations, and I think in other Government procurements, to differentiate sharply between evaluation testing and acceptance testing. There is an increasing lack of reliance on accelerated test methods.

In such a simple thing as determining the loss by volatilization of a fungicide, we may be lead very much astray by accelerating our test procedure. At 20°C., fungicide A may be more volatile than fungicide B; at 80°C., B may be more volatile than A; and we should not attempt to predict relative rates of loss of fungicides from fabric during use on the basis of unsubstantiated oven tests in the laboratory. If we expect to encounter sun temperatures of 140°, storage temperatures of 120°, moist jungle temperatures of 90°, then we should by all means carry out initial determinations of the rate of loss under these several conditions. If we should feel that the method of application may have some bearing on the rate of loss by volatilization and therefore wish to include an accelerated volatilization test among our acceptance tests, then we should carry out a study of rates of volatilization at a series of temperatures ranging all the way from the anticipated

use temperature to the desired accelerated test temperature; we will not necessarily establish a linear relationship. We should establish a continuous curve. Any sharp break between the use temperature and the test temperature certainly throws doubt on the validity of the test procedure.

I believe that this same consideration might well apply to a variety of accelerated tests, although the difficulty of evaluating accelerated tests by this procedure must often be considerable. It would be, for instance, most difficult to establish a step-wise series of exposures ranging from normal sunlight to intense radiation by a carbon arc lamp, to show that the effects were qualitatively the same, and differed only in the quantity of the effect with respect to time.

I have mentioned the confirmation of laboratory tests by wear tests. These have been carried out principally by the Quartermaster Board at Camp Lee, where a rain course has been constructed as an adjunct to the combat course. Most of our combat courses have, as you know, been designed primarily for military training. They teach the soldier how to crawl under barbed wire, how to fall into shell holes, climb walls, and take advantage of cover. The combat course at Camp Lee was designed rather with a view to providing the typical stresses, snags and abrasions which wear out or destroy clothing in combat. It is a training course only incidentally. It is by far the largest instrument for textile testing yet designed.

On the rain course, the soldier performs a similar series of maneuvers—crawling over rocks and through gravel, breaking through stiff undergrowth—the undergrowth is simulated and replaceable as it wears out—or simply walking on a circular track; all this in a continuous rain storm which may be adjusted anywhere from a heavy down-pour to a nasty drizzle. This rain comes from a series of fifty foot stand-pipes with carefully designed spray heads which throw the water up, not down. By the time it reaches the ground the drops resemble rain very closely, in pattern, in velocity, and in drop size distribution.

This ingenious rain making device was created by the personnel of Philadelphia Quartermaster Depot; they have subsequently installed similar devices in rain rooms at Philadelphia and Lawrence.

Another type of clothing testing has been carried out over the past several years at the Climatic Research Laboratory of the Quartermaster Corps, at Lawrence, Massachusetts. Some of the same mechanisms are used. An experimental garment is worn by a number of test subjects through a planned course of exercises. The aim, however, is different, for measurements of results are carried out—usually—on the test subject only. How much did he sweat, what has happened to his body temperature, how tired is he?

The future research aims of the Quartermaster Corps are being developed in detail at the present time. The research program is to be on a much larger scale than that of the pre-war period. The investigations themselves will be considerably more fundamental than those which could be justified under war time urgencies. On this more fundamental level, where we are less concerned with end items, the work of the Quartermaster Corps will come more than ever into fields of interests of AATCC, and we are going to depend on you heavily. So here is the problem, at least in part, on which we will be working together: to provide all of the clothing, the equipment and the supplies needed to keep the individual soldier well and contented, and efficient at his assigned job in any area of the world, under any weather conditions and even under artificial conditions which his work may make necessary—such as high altitude. We must keep him as mobile and self sufficient as possible—not tied too closely to a supply base.

We will need all the help we can get.

* * *

Chairman Barnard: Our last speaker is another old friend, for 16 years a member of the A.A.T.C.C., serving as National Councilor and Sectional Chairman. He was also director of the Textile Research Institute; chairman of the Gibson Nylon Conference; member of the American Chemical Society; American Association of the Advancement of Science; The Society of Chemical Industry. He has the unique distinction of introducing two great chemical companies into the textile field.

Dr. D. H. Powers, director of Textile Development of the Montanto Chemical Company. (Applause)

Dr. D. H. Powers: Just to start a discussion on Mr. Lee's excellent paper, I would like to object that if he will insist on running service tests and actual field trials where the variables are uncontrollable, he must expect inaccuracy. What he should do is run actual labortory tests in which he can control and know the variables. That would greatly simplify his problems. Of course we realize that field tests are rarely simple and reproducible but it is only in the laboratory that we can avoid uncontrollable variations.

. . . Thereupon Dr. Powers presented his prepared paper . . . (Applause)

THE DEVELOPMENT OF PLASTICS FOR PEACETIME TEXTILES

D. H. POWERS

Monsanto Chemical Company, Everett, Massachusetts

IT is difficult to select the most important postwar developments which will grow out of wartime problems, as the factors contributing to peacetime demands will be quite different from the factors involved in the past five years. It is no longer a matter of finding substitutes because of critical shortages of many materials, and there is no longer the necessity of doing the expedient and bypassing the basic fundamental research because of technical manpower shortage. Perhaps the most important factor to consider is that consumer demand will be influenced far more than government procurement ever was by style, advertising, and cost.

We have tried to select those developments which got their start or were primarily developed during the war years. Several very important plastic developments in the textile field will not be considered because they were well underway before the war. Some of these prewar developments will certainly be as important as those which got such an active boost during the war years, if not more so. One other point which we should emphasize is the fact that not nearly enough research was done during the war, and many important developments will be slowed up because it is now necessary to go back and do that basic research work which more available manpower makes possible.

Five textile developments involving plastics were selected as showing great promise in the coming years, and interest in these developments has certainly been catalyzed during the war.

Plastic Films—Free Films and Coated Fabrics

Plastic Impregnation — Shrinkproof Worsteds
Plastic Sizing—Durable Warp Sizing
Plastic Binders—Durable Water, Mildew, Fire Repellents
Plastic Fibers—Functional Fabrics

PLASTIC FILMS—FREE FILMS AND COATED FABRICS

When shipments of rubber were cut off at the beginning of the war, a great deal of effort went into the development of substitutes. As so often happens, these substitutes are here to stay and show promise of growing rapidly and gaining new markets of their own. In the production of raincoats for the Army and Navy, vinyl chloride and vinyl butyral quickly proved to be excellent and in certain respects were superior to rubber. Out of this work grew the development of lighter and lighter fabrics for coating purposes until finally the fabric was eliminated altogether, leaving *"free films."* Recent advertisements in the heavy circulation magazines show the expectation of a very large market for free films to be used in place of coated fabrics. The present textile shortage makes this demand even greater.

These films are modified polyvinyl resins or cellulose ethers and esters, plasticized or copolymerized to give maximum softness and aging. The volatile and fugitive plasticizers originally used *must* be eliminated, and then free films should gain an increasingly important market. It seems probable that they will develop special outlets of their own rather than displace the existing coated fabrics. Recently some excellent work has been done in printing these plastic films with engraved printing rollers.

It is a little surprising that these free films are being promoted as fabrics, when their properties are entirely distinct and different from what we have come to know as textile fabrics. With the advent and growth of non-woven materials, perhaps we should insist that the term "fabrics" only be applied to woven goods.

Once again, the shortage of rubber and rubber latex during the war served as a stimulant for work on substitutes and synthetic latices. The acrylate emulsions were known before the war but their range of application was limited by their high cost and water sensitivity. Vinyl and vinyl butyral dispersions were developed which produced tough continuous films. These dispersions, as well as the copolymerized styrene dispersions, were developed for impregnating fabrics and could be used to produce excellent coated fabrics without the use of solvents. These new synthetic latices also proved to be superior to natural latex in many respects, and it will be interesting to see in the postwar markets how widely they expand the position formerly held by the natural product.

Here we find *three* important fields opening up for *dispersions*. How far they will grow depends on the research effort that is put into their improvement and adaptation for special problems. Here again, they should open new markets rather than replace the well-established coatings which took and will continue to take thousands of tons of nitrocellulose. In the coating field there is still a tremendous demand for the low-cost nitrocellulose lacquers, and this demand may be expected to continue. However, more fire resistant lacquers may be expected to grow rapidly in volume in view of recent legislation and emphasis on flame resistant finishes. The greater fire resistance will be achieved by the use of better suited plasticizers and less inflammable cellulose esters. Where heavy coatings are required, calender coatings continue to offer the best means of depositing a heavy continuous film on the face of the fabric with the least possible stiffening.

PLASTIC IMPREGNATION—SHRINKPROOF WOOLENS AND WORSTEDS

The Army has made the statement that the savings which they made by adopting shrinkproof socks toward the end of the war could have paid for all of their wartime research on textiles. They further indicated that they would try to procure shrinkproof woolens and worsteds wherever they could in the future.

While the chemical processes of reducing wool felting were known for twenty-five years, the use of *plastics* for *shrinkproofing woolens* and *worsteds* has had its entire growth and development during the war. By the use of selected melamine resins it has been possible to produce truly washable woolens with *shrinkage of less than one per cent.* When you realize that these same fabrics before melamine treatment would shrink from twenty-five to fifty per cent, you can see a reason for believing that here is a postwar development for plastics of importance.

While early work gave harsh, firm fabrics, improvement of resins and application techniques has resulted in both woolens and worsteds after melamine treatment which are as soft as, or softer than, an equivalent untreated fabric, and the process has built into the wool fabric greater strength, durability, resilience, stability, and weight. There is promise of woolen and worsted shirtings, dress goods, suitings, blankets, and upholstery with new properties built into them by plastic impregnation. These properties become an *integral part of the fiber* and fabric which are transformed by the process into a new fiber and fabric having a range of physical and chemical properties entirely distinct from untreated fibers, and this difference is as great as the difference between cotton and rayon.

PLASTIC SIZING—THE USE OF PLASTICS FOR WARP SIZING

Perhaps the most important war fabric from the point of view of tonnage of textiles involved was the mildew-fire-water resistant duck. Certainly the war demands exceeded the capacity of all our heavy fabric mills, and many new sources were called on to supply additional yardage. In the lighter ducks it was necessary to starch size the warp yarns, desize, and then impregnate with the mildew-fire-water resistant dope. It was realized that the starch must be removed, as it was a food for mold and would cut down water resistance. Because of the pressure of other problems it was not until toward the end of the war that a study of plastic sizings was made. Tacky, sticky resins could not be handled on the looms but the surprising fact was that properly selected *plastic sizes* gave better *loom efficiency* and worked at *lower humidities*. It was further found that these plastic sized fabrics did not have to be desized and could be impregnated directly without any wet processing whatsoever.

While the end of the war has cut off the demand for these proofed ducks, their study has continued. It has been found that plastic sizes give outstanding results on *acetate* and *cut staple yarns*. Another important feature is the fact that low humidity weave rooms are particularly desirable from the point of view of operator comfort and machinery and equipment durability. How far plastic sizes will go in the postwar markets depends on a great many factors but certainly here is an entirely new and important outlet for plastics in the textile field which was opened up by wartime problems.

PLASTIC BINDERS—PERMANENT PROOFING

In the section above on plastic sizing it was pointed out that the mildew-fire-water resistant ducks were one of the largest procurements of wartime textiles. Experience gained in this field showed the importance and value of durable water repellents, mildew repellents, and fire repellents, and taught us that proper proofing opened new fields and applications for absorbent, inflammable, rottable fibers and fabrics. Certainly, the wide use of cotton in windbreakers was due to the possibility of making it non-absorbent and weather resistant.

Actually, the role of plastics in this

field is one of *binder* or *carrier for the fungicide, pyrocide*, or *hydrocide*. However, the plastic binder must be selected which will not detract from the proofing action of the agents incorporated. At the present time the vinyls and the melamines are the most important and most promising in that they are excellent binders for the proofing agents and they themselves have a mild proofing action. It is probable that in the postwar market we will want to apply one proofing agent at a time rather than combine all of them at once.

Some extremely powerful fungicides were established during the war, and their fixation with plastic binders free from plasticizers which support mold has given mildewproofness of permanence and durability superior to anything now utilized. In the field of fireproofing, wartime studies have shown that the best fireproofing agents are catalysts which alter the heat decomposition products of cellulose. Here again, the fixation of these catalysts with non-flammable resins gives us better proofness than we have been able to achieve heretofore.

In the field of durable water repellents an excellent start was made before the war in chemically modifying the surface of the fiber. It was found, however, that "hydrophobic" chemicals on the surface of the fabrics gave superior water repellency, and the problem of binding these materials to the surface of the fibers became one of selecting the proper plastic binder which would not increase moisture pickup. Today it is possible to achieve extremely durable repellency by combining hydroprobic chemicals with plastic binders. Truly waterproof fabrics can only be achieved by coating a continuous plastic film on the surface of the fabric. But for maximum comfort we are anxious to produce fabrics that breathe and repel water. It is here that the plastic binders which coat the individual yarns or fibers but do not fill up the pores play their greatest role. Certainly, in the field of proofing, plastic binders should find a growing peacetime market as a result of the experience and studies of wartime fabrics.

PLASTIC FIBERS—FUNCTIONAL CLOTHING

Some extremely important work was done during the war on the function of fabrics and the effect of thickness, porosity, absorbency, and smoothness on their comfort, warmth, or coolness. It was realized that fabrics for sleeping bags must have quite different characteristics from fabrics for overcoatings. It was shown that cotton fabrics were excellent outer winter wear and that soft twist was extremely important for rain wear. In this connection, some outstanding shoe fabrics were woven of nylon staple. All these studies have given us cause to reconsider the components which we build into new fabrics. Vinylidene chloride yarns found important wartime use for screening in the tropics. They were not sensitive to corrosion and were not attacked by mold and fungi. While it will be interesting to see whether these plastic yarns can compete with the lower cost metal screening when the latter becomes readily available. there is no question but that vinylidine chloride yarns will prove of importance and value in the upholstery field where smoothness and toughness may be combined with styling and design.

There is little that can be added to what has already been said about nylon. Certainly, its future will continue to grow at a tremendous rate, but here especially will it be important to design fabrics with nylon and nylon blends which take the fullest advantage of the high elasticity and resilience of the nylon as well as its low moisture absorbency and coolness of feel.

Twenty-five years ago we made fabrics of wool for warmth, linen for coolness, and cotton for strength. Today we know that warmth has little to do with the fiber but rather the spaces between the fibers and the thickness of the fabric; that coolness is a function of porosity and the smoothness of the surface of the fabric as well as of the thinness of the fabric. Climatic laboratory studies have shown that we can wear winter clothing *one-quarter as heavy* as our present garments with equal warmth and correspondingly greater comfort. All this indicates that peacetime clothing can be superior to any we now have if we will select the fibers, natural or synthetic, and blend them to produce fabrics and garments whose functions are directly related to their use, based on our better understanding of the factors involved. The *plastic fibers* should play an important part in this development as they contribute materials of outstanding strength, of high elasticity, and with extremely low moisture absorption and outstanding surface smoothness and toughness. As we learn to take advantage of these unique properties we shall develop *functional fabrics* of superior performance. Certainly, here is one of the largest markets for plastics in the postwar textile field.

CONCLUSION

While the textile industry has always provided a large market for plastics, the study of their uses and applications in new fields during the war years appears to be opening far wider markets than ever before were envisioned. We find plastics being impregnated and incorporated into wool fiber to improve it and widen its fields of application. We find plastics as continuous films replacing fabrics and plastic fibers. We find plastics as binders firmly attaching to the natural and synthetic fibers materials which will impart greater mold, fire, and water resistance and a greatly increased percentage of our fabrics will be dyed and printed with colored pigments bound in with plastics. Finally, the sizing of warps and all types of yarns with plastics opens an entirely new and extremely large field for plastics.

Thus we see that the plastics industry, instead of developing as a *separate industry*, shows promise of becoming an *important division* of the textile business.

* * *

Chairman Barnard: That concludes this morning's session. We will continue this afternoon at 2:30 o'clock.

. . . Thereupon at 12:00 o'clock the session adjourned for lunch . . .

CALENDAR OF COMING EVENTS

NORTHERN NEW ENGLAND SECTION:
Meetings: March 22, May 17.
Outing: June 7

RHODE ISLAND SECTION:
Meetings: February 22, March 22, April 26.
(Providence Engineering Society Hall, 195 Angell Street, Providence, R. I.)

PHILADELPHIA SECTION:
Meetings: March 1, April 12, May 24.

NEW YORK SECTION:
Meetings: February 15, March 15, May 3.
(Downtown Athletic Club, 19 West St., New York City.)

PIEDMONT SECTION:
Meeting: February 16.
(Poinsett Hotel, Greenville, S. C.)

MID-WEST SECTION:
Meeting: February 16
(Bismark Hotel, Chicago, Ill.)

SUB-COMMITTEES:
Meeting: April 4.
(New York City. Chairmen of sub-committees who wish to hold meetings should notify the chairman of the Research Committee.)

COUNCIL:
Meeting: April 5.
(New York City.)

RESEARCH COMMITTEE:
Meeting: April 5.
(New York City.)

NATIONAL CONVENTION:
Silver Anniversary Convention: December 12, 13 and 14.
(Hotel Statler, Boston, Mass.)

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An Outline on

WARP SIZING OF SPUN RAYON

RALPH HART

Hart Products Corp.

THE Textile Research Institute Inc. and Textile Foundation have recently published a special report summarizing their research on the weaving efficiency of warp sizing materials used in the sizing of spun rayon warps. It occurred to the writer that the results of this research arranged in the form of an outline, such as given in this paper, might prove useful as a ready reference to those who may wish to continue with this work and particularly to those who may have the opportunity of experimenting only now and then.

The following digest includes, besides the findings of the research project, also data taken from various other sources. It should be mentioned that many of the experiments reported were of a probing nature and were performed under conditions which were known not to be feasible in practice. In this connection, the original report emphasizes the following: "Products now commonly used for warp sizing, as well as some showing promise of future development in this field, were included in this study. The conclusions on weaving are based on the results of weaving experiments made at one set of conditions and it is possible that different results must be observed if the yarn or cloth construction were changed. In order to separate the effects of certain variables it was necessary to perform some experiments which were not in agreement with generally accepted mill practice. As a result, the weaving efficiencies reported here are generally far below commercially accepted standards. However, it is felt that some disparity between laboratory tests and mill practice is justifiable because it emphasizes certain effects, making it possible to secure data with an economy of time and material." For the sake of easy reference, some of the data has been included under more than one heading.

Ultimate Purpose of Sizing

The ultimate objectives of sizing spun rayon are (a) to reduce end-breakage in weaving and (b) to impart to woven goods a desirable hand. It is also necessary that the sizing material may ultimately be readily and, in most cases, completely removed from the goods.

A. FACTORS AFFECTING END-BREAKAGE IN WEAVING

1. Fiber-lay.
   (a) Spun rayon has a burl (hairy fibers); the staple being in comparatively short lengths, short ends stand out from the yarn which must be held down by a uniform coating of size.
   (b) Coating of warps rather than penetration of size is desirable. Enough penetration between the filaments in the yarn is desired to anchor the film coating and prevent shedding.
   (c) Low soluble gums improve adhesion; high soluble gums, such as dextrines, give weight and penetration but poor coating; addition of synthetic soluble gums to starch improves fiber-lay.
   (d) Viscosity of Size.
      (1) Low viscosity of size gives good penetration but insufficient coating to lay the fibers and prevent shedding.
      (2) Too high viscosity of the size may cause tackiness and sticking to rolls in slashing, roughening the warps and exposing fiber-ends.
      (3) There is no consistent correlation between viscosity and size pick-up.
   (e) Softeners cause easier separation of warps at front of slasher; hence, reduce roughening of warps and exposing of fiber ends.
   (f) Shedding.
      (1) High shedding indicates high end-breakage.
      (2) High shedding indicates loss in weight of fiber and is uneconomical.
      (3) High shedding requires frequent cleaning of looms.
      (4) High melting point waxes have a tendency to reduce shedding.
2. Abrasion Resistance.
   (a) A certain minimum abrasion resistance is necessary for good weaving in order to withstand friction on looms; excess is not necessarily beneficial, especially if it is attained at the expense of flexibility and residual elongation.
   (b) All sizing materials increase abrasion resistance and stiffness.
   (c) Dextrines yield warps with the lowest abrasion resistance; methyl cellulose, the highest; and starch and tapioca gum, in between.
   (d) Softeners lower abrasion resistance and increase pliability.
   (e) The addition of softeners to the size often reduces the abrasion but improves the weaving efficiency of the yarn.
3. Residual Elongation.
   (a) Adequate residual elongation of sized warps is desirable to enable the warp to withstand shock and unusual stresses in the loom. Warps low in elongation are brittle and end-breakage may be high in spite of high tensile strength.
   (b) There is a reduction of about 1 per cent in yarn elongation (without tension) due to sizing; slashing with too high abrasive resistance coating may lower residual

elongation even more.

(c) Excessive stretch during slashing reduces the residual elongation; for each increase of 1 per cent in stretch there was a reduction of ½ per cent in residual elongation.

(d) If a spun rayon warp yarn possessing an initial elongation of 14 per cent can be slashed with 6 per cent stretch and possesses a residual elongation of 7 per cent in the finished warp, its residual elongation is still equal to that expected of cotton warps of the same count.

(e) Softeners increase residual elongation.

(f) Residual elongation of the sized yarn is not related to weaving qualities.

4. Stretch in Slashing.

(a) Excessive stretching of the warps during sizing lowers residual elongation, embrittles the warp, and increases end-breakage.

(b) The amount of stretch to which a warp may be subjected depends to a great extent on the initial elongation. If a spun rayon warp yarn possesses an initial elongation of 14 per cent, it may be slashed with 6 per cent stretch, and leave a safe residual elongation of 7 per cent in the finished warp.

(c) Excess viscosity of size causes sticking of warps to rolls, resulting in high stretch in slashing.

(d) It has been shown that regardless of what stretch is given to the warp during sizing, it must be kept constant.

(e) Increased stretch gives a smoother warp, better fiber-lay, less shedding, and higher tensile strength.

(f) The increase in tensile strength with stretch was on an average of 1½ per cent for each per cent of stretch; the highest tensile strength for a certain spun rayon warp was recorded when stretched 12 per cent.

(g) Cloth woven from warps with 1.75 per cent and 12 per cent stretch, respectively, were compared for appearance and dyeing properties and found that the cloth representing high stretch was equal to that representing low stretch.

5. Tensile Strength.

(a) All sizings increase the tensile strength of warps but the tensile strength is only little affected by the type of size.

(b) In staple yarn, the sizing material has a tendency to fasten the fibers together and thus increase the tensile strength of the sized yarn.

(c) Stretch during slashing, up to an optimum, increases the tensile strength.

(d) Tensile strength is not necessarily related to the viscosity of the size.

(e) Tensile strength is not related to weaving qualities.

6. Flexibility and Pliability.

(a) Softeners improve flexibility of warps, reduce brittleness, and furnish surface lubrication.

(b) Best weaving was obtained with warps that were moderately stiff.

B. HAND OF WOVEN GOODS.

1. Dextrines yield the softest goods; thick boiling starches, the stiffest; and water soluble gums, in between.
2. Softeners increase softness and pliability.
3. The burl (hairy fibers) imparts the lofty hand to spun rayon cloth.

C. DESIZING.

1. High soluble dextrines are the most easily removed.
2. Enzyme removal is necessary for complete elimination of the size where starches and gums are used.

Materials Used in Sizing

The function of sizing is to strengthen and lay the fiber ends in order to prevent shedding, to reduce stiffness or brittleness of the sized warps, and to impart the necessary lubrication to reduce friction in the loom. The materials used in sizing are (a) adhesives and (b) softeners; penetrants and preservatives may also be used.

D. SIZING IN GENERAL.

1. Sizing of spun rayon warps is necessary primarily as a filament and hair binder and not for the purpose of strengthening or lubricating.
2. The size should yield a non-granulating (i.e., smooth), non-sticking film, and should give considerable filament coherence with minimum thread cohesion and only reasonable stiffness.
3. Correct sizing protects the yarn against permanent stretch due to normal tension in weaving.
4. Low soluble gums were the most satisfactory as the chief adhesive in sizing spun viscose warps.
5. The tensils strength of the yarn is not greatly increased by sizing, nor is the strength of the sizing material film a determining factor in the weaving efficiency of the warp.
6. Tensile strength and ultimate elongation of the sized yarn are about the same for all sizing materials; stiffness of the sized warp is increased by all sizing materials.
7. Viscose staple fiber warps do not require a penetrant in the size mixture because this fiber is relatively easily wetted out. If penetration is too great, the size gets into between the fine fiber strands of the spun rayon yarns and may cause trouble in the boil-off.
8. Warps treated with size that penetrates give the lowest elongation.
9. Sizes that make translucent solutions are better than those that make opaque solutions.
10. Relatively viscous sizes (starch) have been found essential for adhering loose surface spun rayon fibers close to the core of the yarn and eliminate excessive hairiness or fuziness on the woven fabric.
11. A high humidity in the weave room requires a heavier size than a low humidity.

E. ADHESIVES.

1. Starches.

(a) Starch acts as a filling agent to give body to a size covering while gelatine acts as the cohesive element both with respect to fiber and starch and contributes towards the removal of the starch from the goods in the stripping operation. Soluble starches are deficient in adhesive properties and do not adhere too well without gelatine.

(b) A mixed converted starch-gelatine base size is relatively viscous and is therefore suitable for laying yarn burl close to the core of the yarn.

(c) Film properties of various starches (such as tensile strength, residual elongation, folding endurance, and hardness) do not vary much, with the exception of dextrines.

(d) British Gum.

(1) Without softeners gave large amount of shedding.

(2) With 3 per cent of sulfonated tallow or 9 per cent of sulfonated oil (based on the binder) gave excellent weaving results.

(e) White Dextrine.

(1) Film was weakest, least extensible, and had the lowest folding endurance of any of the corn starches.

(2) Penetrates rather than coats.

(3) Blended with gelatine gave the lowest elongation.

(4) Most easily removed.

(f) Potato Starch.
Film weaker and less extensible than corn starch.

(g) Thin boiling sweet potato starch.
Film somewhat stronger than potato starch.

(h) Thick boiling sweet potato starch.
Same as for thin boiling sweet potato starch.

(i) Corn starch ethers.
  (1) Film much weaker and more extensible than any of the other starch products.
  (2) With 3 per cent glycerine gave good weaving but high shedding.
(j) 40F thin boiling starch.
(k) 20F thin boiling starch.
(l) Medium fluidity thin boiling starch.
(m) Chlorinated Starch.

2. Proteins.
(a) Gelatine.
  (1) Gelatines possess great adhesive strength and when plasticized with suitable softening oils deposit a continuous, thin, tough, elastic yet resilient and protective film upon the yarn.
  (2) Gelatine gives high abrasion resistance which is reduced by softeners, thereby enormously improving weaving efficiency. Gelatine films are about twice as "hard" as any of the other adhesives tested and even when 30 per cent of sulfonated oil is added to the gelatine, the hardness rating remains practically the same.
  (3) Gelatine without softeners gave very poor weaving results, but with 30 per cent of sulfonated oil (based on gelatine) gave excellent weaving.
  (4) Gelatine with 30 per cent of sulfonated oil gave the stiffest warps, yet wove well. The effect on stiffeners of gelatine sized warps of 30 per cent sulfonated oil was less than 3 per cent of softeners on other sizings.
  (5) Gelatine penetrates rather than coats. In size blends of low viscosity with starch, the starch penetrates deeper than the gelatine; with viscous mixes, the reverse is true.
  (6) Gelatine film gave the strongest film of any sizing material tested and was stiffer than a British gum film. The gelatine film had a high residual elongation and a remarkable folding endurance.
(b) Casein.
  (1) Solutions of casein do not gelatinize but dry to a flexible film which, however, is much weaker than a gelatine film.
  (2) Considerably less oil is required to soften a casein sized warp than one sized with gelatine.
  (3) Casein size is water resistant and lacks solubility.
(c) Soyabean protein.
  (1) Soybean protein-glycerine blends were much weaker than gelatine films.

3. Water-soluble-synthetic gums.
(a) In general the film properties of blends of starches and water-soluble synthetics were weaker and more extensible than the starch alone.
(b) Sodium cellulose glycolate.
  (1) Films of sodium cellulose glycolate were stronger than starch, as extensible as gelatine, and had an enormous folding endurance.
  (2) The film of a blend of sodium cellulose glycolate and medium fluidity thin-boiling starch as well as British gum was the only blend with synthetic water soluble gums that was somewhat stronger, more extensible, and had an appreciably greater folding endurance than starch alone.
(c) Methyl cellulose.
  (1) Film properties were similar to sodium cellulose glycolate.
  (2) Methyl cellulose is soluble in cold water but not in hot water and is coagulated by salts.
  (3) Methyl cellulose increases the viscosity of size mixtures composed of starch and gums, toughens the size film, and assists in forming a protective coat on the surface of the warp yarn.
  (4) Methyl cellulose blended with 40 Fluidity thin-boiling starch gave an improved folding endurance.
  (5) Methyl cellulose may be used under 10 per cent of the weight of the starch.
  (6) Methyl cellulose improved the hand or feel of the grey goods.
  (7) Methyl cellulose should be classed as a warp-sizing assistant and not as a substitute for starch or starch derivatives.
(d) Sodium Polyacrylate.
  (1) Films of sodium polyacrylate had exceptionally low tensile strength and enormous extensibility. They were soft and hygroscopic and difficult to handle at 70° F and 65 per cent relative humidity.
  (2) Starch blended with 15 per cent of sodium polyacrylate was the only blend with synthetic gums to show better weaving qualities than the starch alone.
(e) Polyvinyl alcohol.
  Films of polyvinyl alcohol were comparable in strength to starches but were approximately eight times more extensible than gelatine.

F. SOFTENERS.

1. It was shown that of the various yarns in practical use, spun rayon has the lowest coefficient of friction by a safe margin. It is safe to state, therefore, that the amount of lubrication which has to be added to the surface structure of the yarn may be kept to a minimum.
2. Softeners reduce abrasion resistance, reduce brittleness of the sized warp by increasing softness and pliability, and furnish surface lubrication.
3. Softeners reduce viscosity of the size mixes; hence, prevent sticking to rolls in slashing and thereby causing high stretch.
4. Softeners facilitate separation of warps at front of slasher; hence reduce roughening of warps and exposing fiber ends.
5. Softeners prevent sticking to cylinder of slasher and increase residual elongation.
6. One of the most satisfactory oils for use with either gelatine or casein or other sizing materials is a blend of saponifiable and unsaponifiable fats of medium titre. It is believed that the saponifiable fat supplies to the yarn a more satisfactory feel and body, while the use of unsaponifiable oil assists materially in surface lubrication and prevents adhesion of the ends.
7. Excess of softeners may be detrimental. In sizing with British gums, increasing the sulfonated tallow content from 3 per cent to 9 per cent increased the number of loom stops by a factor of ten and also increased the amount of fiber shedding. Likewise no improvement was noted when the glycerine content was increased from 3 per cent to 9 per cent, in fact, the amount of shedding was increased.
8. Sulfonated Oils.
  (a) Usual grade contains about 15 per cent of water.
  (b) General formula: 30 per cent with gelatine; 9 per cent with starches.
  (c) Gelatine softened with sulfonated oil greatly improved the folding endurance of the film.
  (d) An increase of sulfonated oil greatly improves flexibility of film; not so with sulfonated tallow or glycerine.
  (e) Sulfonated oil with gelatine about doubles the elongation of the film.
9. Sulfonated tallow.
  (a) Usual grade contains about 50 per cent of moisture.
  (b) General formula: 5 to 10 per cent of adhesive.
10. Glycerine.
  (a) Films made with glycerine as the softening agent were stronger, more extensible, and less fragile than films containing either sulfonated tallow.
  (b) Where weaving is done under high humidity conditions,

glycerine because of its hygroscopicity, is not so satisfactory as sulfonated oil or sulfonated tallow.

(c) Films containing a large amount of glycerine (9 per cent in the case of British gum size) had very low hardness rating.

11. Sulfonated oil and sulfonated tallow seem to contribute a factor, perhaps surface lubrication, which makes their action different than that of glycerine.

PLATE SINGEING

and its Value in the Heat Treatment and Uniform Processing of Textile Fabrics

H. S. SIVART

THE question of uniformity in singeing is, today, being recognized as of the utmost importance, as affecting mercerizing, bleaching, or the later application of color in dyeing or printing—in rubberizing—or coating with synthetic substances, etc.

The theory has been accepted, and is generally recognized, that fabric condition as to "porosity" or "absorption" depends, primarily, upon the heat applied during any processing.

This signifies the importance of uniform heat treatment of fabrics during initial treatment in singeing, where the most intense heat application is made.

Singeing of fabrics should therefore not be regarded merely as a means whereby "fuzziness" is eliminated, but, rather, as a method of heat treatment affecting the fibrous structure as concerns "absorption."

Whatever method of singeing may be employed, the following conditions should apply, as affecting all after processing:

Uniformity of Heat Application

This is, as stated, of paramount importance as affecting all after processing, in piece dyeing, printing, and finishing, etc.

Intensity of Heat Application

This should be such that by the heat contact applied, and duration of such contact, the body of the fabric should not be adversely affected, as otherwise, the tensile strength may be very seriously impaired.

Such contact, and duration, should, therefore, be adjustable, relatively, to the weight, condition, and type of any fabric, as, in the judgment of the operator, may be best suited.

Variable Speed Drive, and Adjustable Contact

These must be provided, if the foregoing results are to be achieved.

Automatic Temperature Control

This is indispensable to determine the proper heat application necessary.

The duplication of satisfactory results, once determined, will also thus be assured, with uniformity of heat service, at any setting, and for any fabric condition.

PLATE SINGEING

Plate contact singeing has been regarded as one of the most effective methods of heat transmission to fabric, and, more recently, rotary plates have replaced the stationary type, having been proved superior in many respects.

Both internally heated, and externally heated plates have been used. The externally heated plates, however, have in many ways proved far more satisfactory, as being more readily controllable, effective, and economical.

By the use of the externally heated rotary plates, it has been found possible to "localize" the heat to the part of the plate corresponding to the width of the fabric, and, also, to employ the radiant, and convective (flue) heat, (usually wasted), by directing this against the oncoming fabric.

Also, these externally heated rotary plates are now made "de-mountable," so that the mandrels may be used again for new shells, thus effecting a saving of approximately one-third in the cost of singe-roll replacements.

The furnace area, as used for the heating of the externally heated singe-rolls, is adjustable as to the heating space, to correspond with the requirement as to fabric width.

The economy thus obtained is obvious.

Automatic temperature control is provided, which assures, at all times, the uniform maintenance of satisfactory temperature on singe-roll, and this may be adjusted to meet any variable requirement as to character and condition of fabric to be processed.

Full singe-roll contact (up to about 4"), or, if desired, minus contact, (from 0" up to about 12",) may be definitely set, according to fabric requirement.

By such adjustment, governing the intensity and the duration of heat, (in conjunction with variable speed drive,) the transmission of heat to any type of fabric may be effectively controlled, at the most suitable temperature setting within the range provided.

For stationary plates, copper has invariably been used, but does not satisfactorily withstand high singeing temperatures. Also, only a very limited part of the heated surface is contacted, and heat losses, by radiation and flueing, are extremely high.

On the rotary plates, while being slowly rotated against the cloth, the entire heated surface is contacted.

For the rotary plates, heat-resisting alloy-metal has been found to be most satisfactory. This can be heated most economically externally, and much higher temperatures may be carried on these, than would be possible on copper.

On stationary plates, the under part, (where fabric cannot contact,) must, of necessity, be heated to much higher intensity, while on the externally heated rotary plates, the reverse applies. This, in itself, accounts for greater economy and effectiveness in heating the rotary plates externally, as compared with both stationary plates and internally heated rotary singe-rolls.

As the externally heated rotary plates are partially enclosed in the heating chamber, radiation losses are reduced to a minimum, and considerable economy in heating is assured.

As compared with the results obtained by open-flame or blast burners, plate singeing is considered by some as being more uniform, effective and economical, if control arrangements be adequately provided, and be satisfactorily adapted to general singeing requirements.

Oxidation of Metal

The heat resisting alloy metal singe-rolls are free from oxidation at high singeing temperatures.

Copper oxidizes freely, and the oxide, "carried-through" in the fabric to subsequent processing, has a "sadding" effect on color, and also proves unsatisfactory for such after processing as "rubberizing," etc.

(*Continued on Page* 84)

A LOW COST REFLECTOMETER AND METHOD FOR COMPARING DETERGENCY

MURRY L. HURWITZ

Engineer, Apex Chemical Co.

WHILE methods (1) (2) which attempt to evaluate detergents have been described, there exists no accepted standard test. Our laboratories have developed a simplified method which gives reproducible results, involving the use of a low cost reflectometer for assigning quantitative numerical ratings to the washed samples.

The actual test consists of a soiling, a laundering, and a comparison of the washed samples. There is no real problem involved in standardizing a laundering test since not only can miniature laundry wheels be designed and utilized (1) (2), but also there may be used the standard Launder-Ometer (3). The important conditions, for comparative purposes, are to have the temperatures, times and action the same in all cases. To this end, those not in possession of any of the aforementioned machines may even utilize a mason-jar ball mill arrangement (Fig. 1), which operates on the same principles as the Launder-Ometer. We have made a great many tests in this type of equipment and found it to give satisfactory results. Although it does not lend itself too readily to very high temperature laundering tests, such as at a boil, we have found that this set-up will allow tests to be run at elevated temperatures, with only a few degrees drop during the run, the same drop occurring in all samples being run at the same time, from the same initial temperatures. Better control may be obtained by enclosing the mill frame with glass plates and keeping the air within the enclosure thermostatically at the initial temperature of the run.

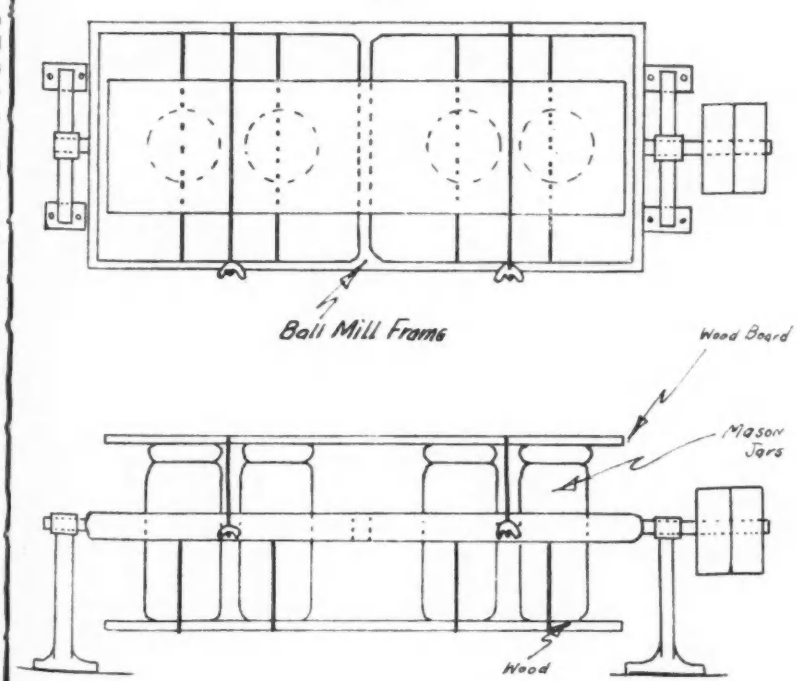
One of the two serious problems remaining is soiling. Unless a very great number of tests must be made daily, necessitating construction of a soiling machine, such as designed by Van Zile (4), the simpler methods of soiling by strip immersion (1) (2) can be satisfactory. The standard soil which we utilized is similar to that of Snell, since we prefer cottonseed oil to lard or tallow to enable us to compare cold scours more readily.

The final step in classifying and comparing detergents is the evaluation of the cleansing action. Various instruments have been used to compare the "brightness" of washed samples with the original cloth, as well as with magnesium oxide or secondary standards. The Ives Tintometer (2), the Hunter Multipurpose Reflectometer (5), "Martens" reflectometer (6) and other specially constructed, or visual, comparators (1) (5) (8), all serve to measure the reflectance of the samples and all are either complicated or costly. We have designed, built, and used with excellent results, the "45° reflectance" reflectometer described by figure 2. This machine should cost no more than $30 and gives accurate, reproducible and standardizable results. The major parts needed are tabulated in Table 1. This machine is similar in principle to the Hunter multipurpose reflectometer with the modification that the photronic cell is stationary and readings of brightness are made on a micro-ammeter, since the light intensity gives practically a linear relationship of about 260 micro amperes per lumen. The sample clamping device is simplified and is adapted from a photographic printing frame in which the spring clamps hold the sample firmly against a sheet metal shield with target opening at the spot where the light beam falls. This prevents wrinkles from casting shadows which would give inaccurate readings, and, at the same time assures ease of changing the position of the sample and the samples themselves. The entire inner surface of the photocell chamber is painted with a very matte black photographer's paint to eliminate as much stray light as possible. The rheostat, for adjusting the light intensity when using the primary or secondary standards, allows direct reading of the micro-ammeter in "Per Cent Brightness" relative to either the magnesium oxide or the original cloth itself.

The procedure upon which we have standardized combines features of the methods of Rhodes & Brainard, Snell and the wash tests of the American Association of Textile Colorists and Chemists as well as simplifications of our own.

The steps are as follows: Sheeting, having a thread count of 90 x 94, which had been previously desized and laundered twice, was soiled by passing it through a

Figure 1



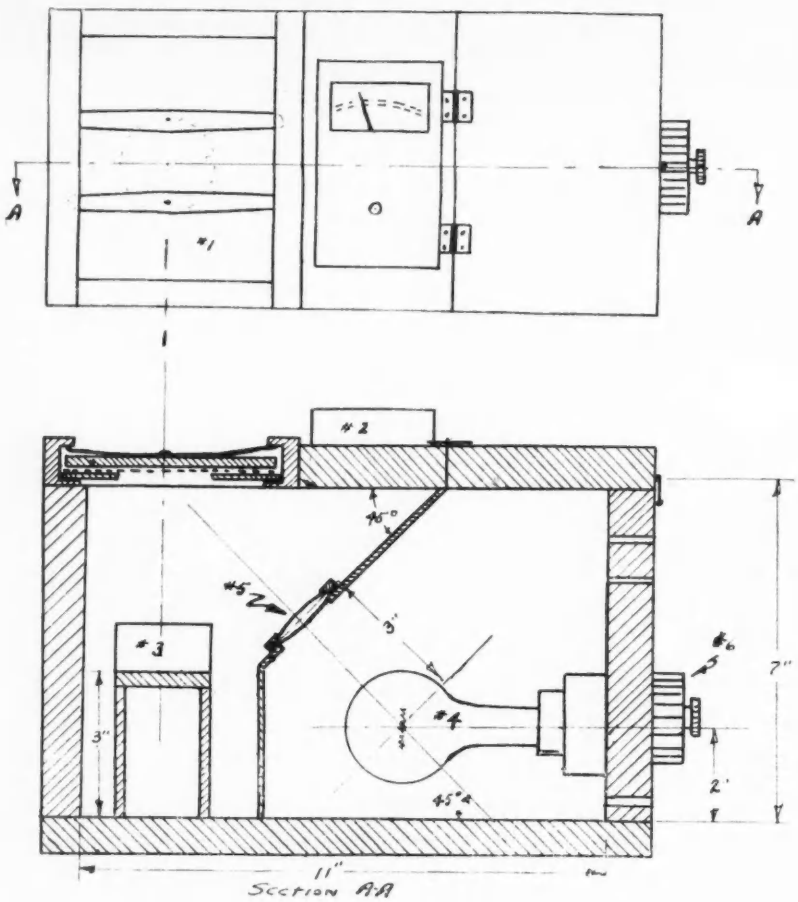


Figure 2

soil consisting of carbon black 4 gm., mineral oil 5 gm., cottonseed oil 3 gm., and carbon tetrachloride 4000 gm. The sheeting was cut in strips 4" wide by 3' long and passed through the soil solution using a soiling box similar to that described by Van Zile, which is a modification of the Nausbaum photographic developing tray. Two passes were made, allowing two minutes to elapse between passes, and the cloths were hung horizontally to dry. Uniformly soiled samples of 30 per cent ± 2 per cent brightness relative to a magnesium oxide standard were obtained in this manner. The soiled samples were left to air dry for 15 hours before use.

For washing tests, the soiled samples were cut into strips 4" x 12", placed in pint mason jars with 250 cc. of solution to be tested and 5 rubber balls (or No. 1 rubber stoppers). The jars, after adjusting the temperature, are placed in the washing machine (Fig. 1 or Launder-Ometer) and run at 80 R.P.M. for 10 minutes. The samples are removed, rinsed in five distinct changes of water, expressed and dried at 50° C. for one hour. They are then pressed with a cool iron and the brightness reading taken on the reflectometer.

The reflectometer is first standardized by a freshly prepared magnesium oxide sample (7), a standard magnesia block, or porcelain secondary standards. The original sheeting gave us a reading of 77.8 per cent compared to magnesium oxide. The washed samples are placed in the frame and at least four random readings are taken, with at least two on each side of the cloth, and the average taken. By this washing method we find an average of only 0.5 per cent variation in brightness between the readings on any one sample. Comparisons can be made by comparing relative cleaning of definite percentages of the detergent materials or by calculating "indices" by the method of Rhodes and Brainard.

For example, in making comparison runs, the data in Table II and Table III will illustrate how this method will serve as an index for either further experimental work in developing detergents, or for classifying detergents already in production. In this case, the experimental product XR711 shows definite promise as a supplement and replacement for soap, and Cold Scour No. 3 shows very good detergent action at lower temperatures.

TABLE I

1. 4 x 5 Printing Frame*
2. Microammeter 0-100 m.a.
3. Weston Photronic Cell
4. 100 Watt Clear Bulb
5. Magnifying Lens 3" Focal Length
6. Rheostat

* Substitute Sheet Metal Shield with 2" diameter hole in center for the glass.

TABLE II

Test @ 25° C.; One Wash; Ten Minutes

Solution	% Original Brightness Regained
2% Soap*	28.0
1% Soap 1% Apex XR711	29.6
2% Apex Cold Scour #3	34.0

TABLE III

Test @ 60° C.; One Wash; Ten Minutes

Solution	% Original Brightness Regained
1% Soap	30
½% Soap; ½% Apex XR711	31
1% Apex Scour	26
1% Fatty Alcohol Sulfate Ester	22

* Industrial soap pdr.

The methods and equipment described yield reproducible results with simplification of apparatus to make it amenable to utilization by unskilled personnel. Dependable tests can be made with relative ease and accuracy, and numerical indices can be assigned to the cleansing action of the various detergents.

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6. U. S. Bureau of Stds., Letter Circular No. 617.
7. U. S. Bureau of Stds., Letter Circular No. 547.
8. ASTM Tentative Standard D523-44T, 1944.

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Plate Singeing

(Continued from Page 82)

Corrosion of Metal

Warp-size ingredients such as chlorides, sulfonated oils, etc., have been found to have a harmful effect on all metals such as may be used in plate singeing, and seriously affect the service life of both stationary plates and singe-rolls of various metals.

The use of such ingredients in warp-size compounds has long been declared unnecessary by eminent chemists both here

and abroad, and other satisfactory substances may be, and have been, used for many years by some of the leading manufacturers. Needless to say, any acid vapors, at high singeing temperatures, may be expected to have also a serious effect on the tensile strength of any fabric, and the use of slashing compounds responsible should be discontinued. If present in the fabric, they should be eliminated before singeing.

From chlorides, hydrochloric acid vapor is generated in singeing, and from sulfonated oils, (which contain sulfur trioxide) sulfuric acid vapors.

These are injurious alike to both metal and fabric, and their use has been condemned.

Method of Assembly and Service

Rotary plate singeing assemblies have been furnished in single units for face singeing, and in double units for face and back singeing in one operation, and, also, in single units for face singeing, in conjunction with flame burners for back singeing.

All such assemblies are adaptable to any modern method of gas service, and equipped with the most convenient control arrangements as to variable speed, contact, and automatic temperature control.

They may be arranged for either continuous, or intermittent, run of fabric, at speed of operation, and with contact arrangements as may be best suited for any particular type of cloth. A protecting cover is provided for the singe-roll, and this may be swung in position over the singe-roll to protect the cloth during a stoppage of a run, and serves also to expedite the heating of the singe-roll. This cover may readily be swung to the "off" position in starting the run of fabric, and all manual controls are centralized for the convenience of the operator.

By the method of heating applied, the rotary plate is heated uniformly across the service area required for any given width of fabric, and, by automatic control, the temperature is maintained, at whatever setting may be required, throughout the singeing period, whether for continuous, or intermittent, run of fabric.

The control of the gas-air mixture service, to all burner ports, is vested in the single valve ratio control, at which point, by suitable venturi injector, the gas is entrained through the zero gas governor, and the air-gas mixture is then distributed uniformly to the various burner ports in the heating chamber. By suitable means, the single valve ratio control is, in turn, governed automatically by the action on its air-valve by the automatic temperature controller.

No pre-mixing apparatus, other than that referred to, is required.

City gas, gasoline gas, natural gas, and compressed petroleum gas, have all been used satisfactorily for the heating of the rotary single-rolls.

Air for combustion, at suitable pressure, and in volume according to heating requirements, is served by an independent compressor of suitable capacity, to the venturi injector, where the air-gas mixture is accurately proportioned.

Singeing units with singe-rolls of various lengths have been furnished, ranging from 44″ face length and 10″ diameter, to 120″ face length and 16″ diameter.

Frame, cloth-run, and contact arrangements are provided, according to requirements, for either continuous or intermittent singeing, and variable speed drive best suited to operating speed desired.

The high temperature which it is possible to carry on the heat-resisting alloy singe roll, when externally heated, insures the uniform transmission of heat to the fabric by one contact, at whatever setting, and therefore a thoroughness of singe not otherwise obtainable.

Multiple heat applications, by flames, or plates, of unknown and ungoverned intensity and unformity, are likely to over-heat the fabric unevenly, and may thus also cause an impairment of the tensile strength.

The normal moisture content in the fabric is usually sufficient to protect the fabric adequately during the first high-heat contact, but, after the moisture has been evaporated, danger of tendering and impoverishment is more likely to occur.

Any irregularity in heat application in singeing may, therefore, adversely affect the fabric, and, also, the results in after processing.

Exactitude in all processing, whether by heat, tension, friction, or pressure, must eventually show in the finished fabric, and the lack of it also.

The primary heat treatment of fabric and fiber is today recognized as being of the utmost importance, and must undoubtedly be governed adequately if quality of product is of consequence, and is to be achieved.

While higher initial investment costs may be incurred (as compared with less effective and dependable singeing methods), the ultimate results, and operating costs, have been proven favorable, over a considerable period of years, and continuing satisfactory service has been maintained, in the operation of the externally heated alloy-metal rotary plates.

When more modern methods of control, now available, may be more generally applied to the manufacturing and processing of textile fabrics, a higher standard of perfection may be attained, and the industry, in general, be placed on a higher plane where quality of product will be considered to be of more importance than any fractional price advantage.

The "passing-out" of many long-established concerns may well be attributed to "obsolescence" of equipment, and the dominance of production by "precision methods" may be sufficient evidence of this.

The "aftermath" facing all industrial activities, will prove most disastrous to those who fail to keep pace with technological improvements affecting production of any kind, and "the survival of the fittest" will apply alike to all who are engaged in competitive effort.

In the textile industry, "the rule of thumb" and "guesswork" must give way to technical improvement, and particularly to a better understanding, and control, of all factors affecting quality of production.

In a market where quality is not readily obtainable, there can hardly be found any real basis of value.

TRADE NOTES • NEW PRODUCTS

• SYMPOSIUM ON FINISHING PROCESSES

A symposium on the Fundamentals of Finishing Processes will be held at the Polytechnic Institute of Brooklyn under the Chairmanship of Dr. Milton Harris, Visiting Professor of Textile Chemistry, on Saturday, February 23, 1946.

The program is as follows:

10:00 A. M.
"Some Fundamentals of Flame-Proofing Textiles"
Sidney Coppick,
American Viscose Corporation

11:00 A.M.
"Water-Repellent Fabrics"
Arnold Sookne,
Milton Harris Associates

12:00 Noon
Luncheon Recess

1:30 P. M.
"Fungus-Proofing of Cotton Textiles"
Dr. Ralph Sui,
Philadelphia Quartermaster Depot

2:30 P. M.
"Theory of Shrink-Resisting Treatments for Wool"
Milton Harris,
Milton Harris Associates

These talks will emphasize some of the fundamental aspects of the problems and will bring forth the results of some of the researches carried out during the war.

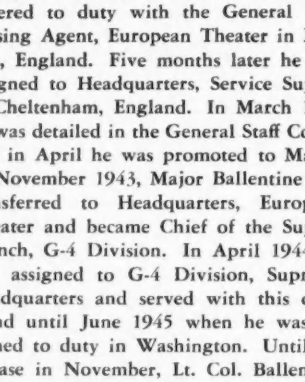
• RETURN TO SMITH, DRUM

Released from the Army in November, Lt. Col. Joe M. Ballentine has rejoined Smith, Drum & Company as Southern Representative. Ordered to active duty in November, 1941, as a First Lieutenant, he was assigned to the Procurement Division with the office of the Quartermaster General, Washington, D. C. Until July 1942, he was engaged in work on contract distribution and on production expediting.

Joe M. Ballentine

In July he was promoted to Captain and ordered to duty with the General Purchasing Agent, European Theater in London, England. Five months later he was assigned to Headquarters, Service Supply in Cheltenham, England. In March 1943 he was detailed in the General Staff Corps, and in April he was promoted to Major. In November 1943, Major Ballentine was transferred to Headquarters, European Theater and became Chief of the Supply Branch, G-4 Division. In April 1944 he was assigned to G-4 Division, Supreme Headquarters and served with this command until June 1945 when he was returned to duty in Washington. Until his release in November, Lt. Col. Ballentine was an Assistant to Chief of Staff, Army Services Forces.

Lt. Comdr. P. M. Parrott, S.C.U.S.I.V.R. has also returned to Smith, Drum & Company and will share with Mr. Ballentine the direction of the company's Southern sales activities.



P. M. Parrott

Mr. Parrott entered the Navy August 29, 1941, as a Lieutenant j. g. and was assigned to duty as a Textile Specialist at the U. S. Naval Clothing Depot, Brooklyn, New York, where he served 16 months in Textile and Clothing Inspection and research for the Navy Department. In November of 1943 he was ordered to U. S. Naval Supply Corps School at Harvard University for four months and thence to the U. S. Submarine Base, Pearl Harbor, T. H. Here he spent 18 months as Supply Officer at the Submarine Supply Center handling submarine spare parts for the entire Submarine Fleet in the Pacific. In September 1944 he was returned to Washington, D. C., where he served as Officer in Charge of Research and Development of textiles and clothing for the Navy Department's Bureau of Supplies and Accounts. With the consolidation of the Army and Navy textile purchasing activities in New York, Lt. Cmdr. Parrott was assigned to U. S. Naval Clothing Depot, Brooklyn, New York, where he served as Administrative and Fiscal Officer until his time of discharge, October 30, 1945.

Smith, Drum & Company's Southern Sales Office, under the joint direction of Mr. Ballentine and Mr. Parrott will be opened shortly. Announcement of its location and the time of opening will be made within the next few weeks.

• JOINS WESTVACO

Theodore Riedeburg has joined Westvaco Chlorine Products Corporation, New York, as Technical Service Representative in charge of Westvaco Insecticides and Fumigants including D.D.T., Methyl Bromide and Grain and Soil fumigant mixtures. In his new capacity, Mr. Riedeburg

Theodore Riedeburg

will be available for consultation with executives, plant managers and sanitation engineers on problems concerning insect infestation.

A graduate in Botany and Chemistry from Marquette University, Mr. Riedeburg was until recently connected with Dow Chemical Company for three years.

• APPOINTED ANSUL MANAGER

Clarence L. Johnson, a member of the sales staff at the Dugas office at Chicago for Ansul Chemical Company, Marinette, Wis., was appointed manager of that office effective January 1. He succeeds Floyd

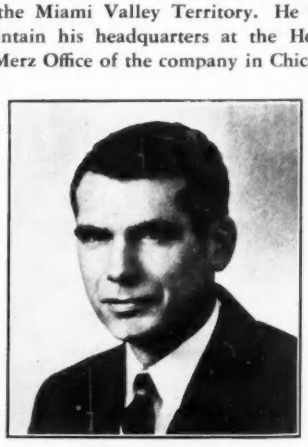
Clarence L. Johnson

M. Duvall who has been transferred to Indianapolis where he will be district manager of refrigeration sales.

Before joining the Ansul organization, Johnson was safety supervisor for Sherwin-Williams Company and prior to that was engaged in similar work for La Salle Steel Company and Republic Steel Corporation.

• HELLER & MERZ APPOINTMENT

The Calco Chemical Division, American Cyanamid Company, Bound Brook, New Jersey, announces the appointment of John E. Burdsall, as sales representative of their Heller & Merz Department, in the Miami Valley Territory. He will maintain his headquarters at the Heller & Merz Office of the company in Chicago.



Joe E. Burdsall

Mr. Burdsall is a graduate of the University of Cincinnati, of the Class of 1933, with a degree of Geological Engineer. He obtained his early experience in the paper industry while still at the University, working at the Champion Fiber & Paper Company and the Beckett Paper Company, pursuing cooperative work with his college studies.

For the past twelve years Mr. Burdsall has been with the Crystal Tissue Company, at Middletown, Ohio, and in recent years has been a member of their technical staff. He has been an active member of the TAPPI and has been a member of the Executive Committee of the Ohio Section as well as a past chairman.

• A.I.L. APPOINTMENT

The appointment of James C. Stirling, former Army Captain and specialist in industrial standards, as manager of the New York Textile office of the American Institute of Laundering, is announced by the laundryowners' national trade association. Mr. Stirling replaces John M. Marshall as the A.I.L.'s New York representattive.

James C. Stirling

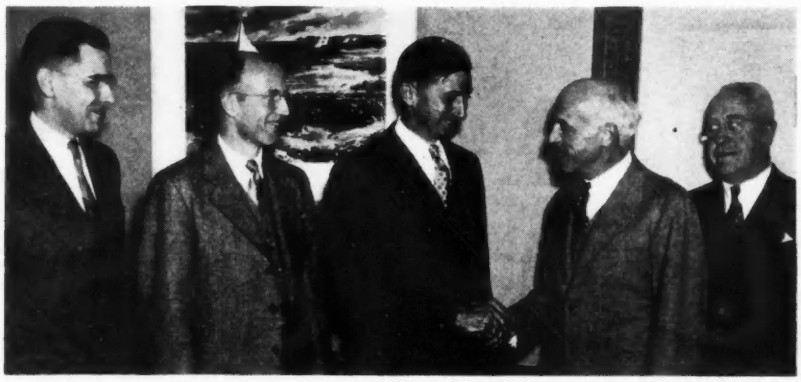
As manager of the A.I.L. Textile office, Mr. Stirling comes to his new assignment prepared by background and experience. He will direct the sales and promotion of the American Institute of Laundering "Seal of Approval," a consumer's label testifying to quality of cloth, color fastness, shrinkage, and launderability. Not only does the A.I.L. tested and approved seal appear on washables, but its use also has been applied to products affecting wear and washability, such as deodorant creams.

Mr. Stirling's appointment to the A.I.L.'s New York office, where he will serve the interests of 3,800 professional laundries in their Seal of Approval, marks renewed activity in the laundry testing program dormant during the war.

The Seal program is based on laboratory testing of washables, in which textile manufacturers or garment producers submit their products to rigid checking in a minimum of 240 tests during a 12-month period. Believed to be the broadest and most dependable of all the seal programs for consumers, the A.I.L. tested and approved label is already in use by more than 50 concerns.

• HOOKER APPOINTMENT

The Hooker Electrochemical Company of Niagara Falls, N. Y., has recently assigned Ralph E. Davis as its representative in the New England states with headquarters at Boston, Mass. Mr. Davis, a graduate of Pratt Institute, has been with Hooker since 1941 as a salesman and consultant to the leather industry. He will retain this responsibility in addition to his sales coverage of the territory.



W. S. Carpenter, Jr., president of the Du Pont Company, and B. M. May, general manager of the Rayon Department, congratulate the first three scientists promoted under a plan for a new series of Du Pont research positions designed to make science as a career as attractive as the administrative field in research. The plan was announced on January 4 by the Technical Division of the Rayon Department of E. I. du Pont de Nemours & Company. It provides for three classifications of "research associates" with unusual individual prerogatives in selecting fields of research and exploring the fundamental frontiers of knowledge, without the usual distraction of administrative routine.

Left to right: Dr. E. V. Lewis of the Nylon Research Section, Wilmington, who became a junior research associate; Dr. W. E. Roseveare, research supervisor in charge of the basic research group of the Viscose Rayon Research Section at the Spruance Plant, Richmond, Va., appointed a research associate; Dr. E. F. Izard, Pioneering Research Section at the Yerkes Plant, Buffalo, N. Y., also a research associate; Mr. Carpenter and Mr. May.

• MATTSON CHEMICAL

K. C. Mattson, formerly Los Angeles Branch Manager for the Griffin Chemical Co., has announced the formation of the Mattson Chemical Co.

The new firm will act as West Coast agent for chemical manufacturers serving the petroleum, soap, detergent, pharmaceutical and food processing industries.

Mattson Chemical Co., has offices at 124 West Fourth Street, Los Angeles 13, California.

• PHILADELPHIA ALUMNI BANQUET

More than 200 graduates of the Philadelphia Textile Institute and others in the textile trade, heard Edwin D. Fowle, publisher of *Textile World*, speak on the subject "Looking Ahead in Textiles," on the occasion of the 45th Annual Mid-Winter Alumni Banquet held in the Clover Room of the Hotel Bellevue Stratford in Philadelphia on January 31st. Mr. Fowle said in part:

"Those who have anything to do with leading and guiding a major industry have a heavy duty to perform with respect to the welfare of their nation and of the world. If they are sincere, intelligent, and well informed, they can contribute materially toward world security and world peace. The textile man has two simultaneous and equally important basic responsibilities: first, to build and maintain a soundly constituted industry; second, to establish a healthy atmosphere in which that industry and all other soundly constituted industries can thrive. His first step must be to broaden his perspective through suitable education, education which will free his mind of inherited dogmas that restrict his thinking, education which will prevent his repeating those blunders which have cost the world so dearly in the past. Next, and finally, he must get over the "let-George-do-it" frame of mind and recognize that as a member of a key industry, he has not only the right but also the duty to lead his fellow citizens to higher, surer, safer, and happier ground."

Bradley C. Algeo, first President of the Alumni Association who served for the first thirty-seven years of the organization's existence presided as Toastmaster.

• BURKART-SCHIER BOOKLET

Burkart-Schier Chemical Company, Chattanooga, Tenn., has recently issued a booklet entitled "The Role of Chemistry in the Development of Textiles." The purpose of the booklet as stated in the preface is to "indicate something of the antiquity and the world-wide diffusion of the arts of dyeing and finishing fabrics, and also to suggest that, through long ages, this has been a continuous and connected progression of ideas, experiments and achievements. Many ages, many peoples,

and many parts of the world have contributed to the sum of our present knowledge in these matters. We know of no civilized people who, in the past, have not added some process or product to the general sum of the world's textile arts. Our own age of applied research, and the vast and inspired use of mechanical force, is no exception to this rule. We are still a part of this long history. The present is but a brief pause between the past and the future."

In carrying out the theme of the booklet a series of 24 sketches are given, titled as follows: (1) The Poor Apothecary with a Great Idea (Carl Wilhelm Scheele); (2) Chemist with Honor (Claude Louis Berthollet); (3) The Birth of the Roller (Thomas Bell); (4) Forbidden Calico; (5) Beyond the Laboratory (Jean Antoine Claude Chaptal); (6) American Dyestuff Pioneer (Dr. Edward Bancroft); (7) Bright Dyes from Black Tar; (8) The Purple of the Ancients; (9) Nature's Blue; (10) Early Dyers; (11) Pioneers in the Chemistry of Textiles (Horace Lowe and John Mercer); (12) Root of Red; (13) Father of Modern Chemistry (Antoine-Laurent Lavoisier); (14) A Fiber is Born (Count Hilaire Chardonnet); (15) How Old is Cotton—How New?; (16) The Magic of Mordants; (17) Oberkampk: Great Name in Printing; (18) Scarlet and Crimson; (19) Wool: Continuous Story of a Fiber; (20) The "Calimala" Wool Guild; (21) Batik; (22) Primtive Color; (23) Complicated Calico; (24) Luxurious Cottons.

Copies of this booklet are available upon application to Burkart-Schier.

• FALL COLORS FOR MEN'S HATS

Smokie Brown, a misty greyed version, Skyline Grey, a muted slate tone, and Virginia Turf, of subdued greenish tonality, comprise the three colors featured in the 1946 Fall Card for Men's Felt Hat Bodies, just issued by The Textile Color Card Association to its members. Each shade has been chosen for its style importance and for its adaptability for dyeing on fur felt stock and wool felt stock.

• CLASSIFIED ADVERTISEMENTS •

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $6.25 per column inch or less per insertion.

POSITION WANTED: Hosiery Chemist and Colorist with several years experience on formulation research and production. Box 774.

POSITION WANTED:—Dyer 34 years old, 15 years experience, cotton, rayon, acetate crepe piece goods, and knit products, some finishing experience. Box 799.

CONFIDENTIAL EMPLOYMENT SERVICE — We invite correspondence (confidential) with Dyers, Chemists, Colorists, Superintendents, Master Mechanics, Office Managers, and others seeking positions and with employers seeking high-grade men to fill vacancies or to make replacements. Charles P. Raymond Service, Inc., 294 Washington St., Boston, Mass. Over forty-five years in business.

WANTED: Textile piece-goods dyeing plant supervisor. A man thoroughly familiar with the dyeing of mixtures of viscose, acetate, wool and aralac to take over the supervision of grey-room, boil-off and dyehouse of large piece-goods dyeing plant located in the Metropolitan New York area. Applicants should furnish photo with qualifications and salary desired. Box 810.

POSITION WANTED: Superintendent of Dyeing—Chemical Engineer — Textile Technician — 20 years Mill and Laboratory experience. All types Yarns—Skein and Package. Specializing Fast Colors; Double Resist Silk, Acetate, Nylon. Open for responsible position in charge dyehouse or technical sales dyestuffs and chemical specialties. Write Box 817.

WANTED: TECHNICAL SALES ASSISTANT to become permanently connected with nationally recognized manufacturer of textile processing specialties. Prefer graduate of textile institute with mill experience. Will act as assistant to district manager covering Minnesota, Wisconsin, Iowa, Illinois, Indiana and Ohio. Salary plus bonus. Write giving complete educational and business background. Replies held in strict confidence. Our organization knows of this advertisement. Write Box 820.

WANTED: Chemist or Chemical Engineer by manufacturer of synthetic fiber. Must have experience in textile and dyeing field, research, analytical and process development. Write Box 821.

POSITION WANTED: Textile Chemist, Sc. D., twelve years mill-experience in dyeing and finishing cotton, rayons, wool. Five years applied textile research. Up-to-date on resins and synthetic fibers. Desires leading position in production control research and development of textile processing industry. Write Box 822.

WANTED: A leading manufacturer of textile chemicals is looking for an experienced salesman for their mid-western territory. Applicants must have a thorough textile education, preferably some years of practical mill experience, as well as selling experience in the middle west. Applicants please address Box 823.

POSITION WANTED: Laboratory Assistant—Textile Colorist—Young, ambitious, accurate, dependable, would like position in textile laboratory of progressive dyehouse or with dyestuff or chemical specialties manufacture. Philadelphia, Write Box 824.

FOR SALE: 1—17" Fletcher Master Type Centrifuge, size 17M, type AST, stainless Steel lining and Bronze Basket, complete with motor. Eavenson & Levering Co., N. E. Cor. Third and Jackson Streets, Camden, New Jersey.

SANDOZ PRESENTS *The color achievement of the month*

Outdoor Colors BY UNITED PIECE DYE WORKS

There's promise of spring in these pastel prints by United Piece Dye Works of Lodi, New Jersey . . . overall patterns ranging from muted Paisley designs to spirit-lifting florals on clear and sunny pastel rayon silks.

For authentic color interpretations textile leaders like United include Sandoz among their suppliers . . . often calling upon Sandoz for assistance in developing progressive ideas in coloring and in capturing desired effects.

In thinking ahead in textiles, Sandoz chemists and technicians keep in constant touch with both the fashion and manufacturing worlds, while continuing to extend the possibilities of efficient and distinctive coloring. Out of Sandoz Laboratories have come Pyrazol Fast Orange GLL and Pyrazol Fast Green GLL — of excellent light fastness . . . for superior wet fastness, *particularly* on rayon there are the Sandoz Diazamine (developed) colors.

For acid, chrome or direct dyes . . . or auxiliary chemicals . . . for both natural and synthetic fibres . . . be guided by the successful "color achievements" you have been seeing in these Sandoz advertisements.

Sandoz application laboratories are located in New York, Boston, Philadelphia, Los Angeles, Charlotte, Toronto, where stocks in wide range are carried. Other branches are in Chicago, Paterson and Providence.

SANDOZ CHEMICAL WORKS, INC., 61 VAN DAM STREET, NEW YORK 13, N. Y.

SANDOZ *thinks ahead with textiles*

SANDOZ

Manufacturers of

ANILINE -- ALIZARINE -- CHROME

and

ACETATE DYESTUFFS

FUGITIVE WOOL TINTS
FINE ORGANIC PIGMENTS
TANNIC ACID and CHEMICALS

Our laboratories are always at your service

ZINSSER & COMPANY, Inc.
ESTABLISHED 1897
Manufacturing Chemists
HASTINGS-ON-HUDSON NEW YORK

QUALITY **RICHMOND** PRODUCTS

Less Handling with

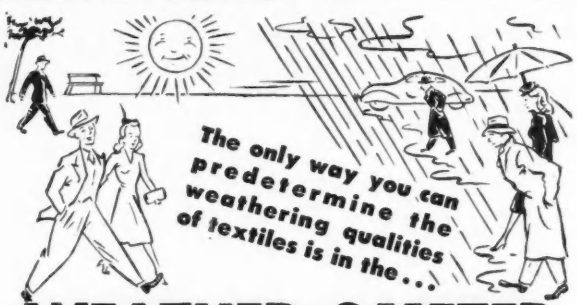
AFTER CHLOR
Eliminates 3 to 5 Handlings

Bleach with
Hypochlorite
Rinse and Use

AFTER CHLOR
SAFE FOR RAYONS TOO

Write for FREE Sample

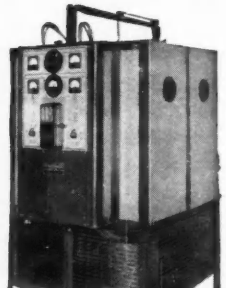
RICHMOND OIL, SOAP & CHEMICAL CO., Inc.
1041-43 FRANKFORD AVE., PHILADELPHIA 25, PA.



WEATHER-OMETER

● The deteriorating effect of exposure to weathering in actual use must be known by textile manufacturers. The Atlas Weather-Ometer brings these weathering conditions right into your laboratory where dyestuffs and fabrics can be tested and reliable results obtained.

A few weeks exposure in the Weather-Ometer with a cycle of controlled light, water spray, and selected temperature and humidity, equals years of outdoor service. Safe to operate 24 hours a day without attention.



Used all over the world — Weather-Ometers, Launder-Ometers, Fade-Ometers

ATLAS ELECTRIC DEVICES CO.
361 West Superior Street, Chicago 10, Illinois

HERE ARE THE BASIC MATERIALS YOU NEED...NOW!

GOVERNMENT-OWNED WAR SURPLUS

Chemicals

SPECIAL NAPALM THICKENER

Mixture of Oleic, Napthenic, and Cocoanut Fatty Acids, representing a metallic soap compound. 971,850 lbs., Denver, Colorado. 216,200 lbs., Birmingham, Alabama. Packed in drums, price $.10 per lb. in carload lots and $.12 per lb. l.c.l.

One of the most important of the Surplus Disposal jobs assigned to the War Assets Corporation, a subsidiary of RFC, is the selling . . . *now* . . . of a large and varied stock of Surplus Chemicals. These chemicals represent a tremendous Government investment, but *they are priced for quick sale and represent real values to industrial users!*

Because of space limitations, only a few of the major items are offered in this advertisement. If you are interested in any of the items offered here, write, wire or telephone the RFC Agency Office listed below, where the stock is located. Act quickly! All items offered are F. O. B. Location. Credit terms may be arranged.

VETERANS: To help you exercise your priority, special veteran service facilities are now available at our offices.

CHECK THIS LIST FOR YOUR NEEDS

and have your name placed on our regular mailing list by mailing the attached coupon.

CHECK AND MAIL TODAY!

To War Assets Corporation:

Please send me further information on the following products:

- ☐ Glacial Acetic Acid, CP, 10,067 gallons in one-gallon bottles, San Francisco, Calif., price $1.00 per gal.
- ☐ Glacial Acetic Acid, CP, 1,416 gallons in one-gallon bottles, Portland, Oregon, price $1.00 per gal.
- ☐ Bakelite Rods and Sheets, large quantities, various sizes and dimensions, Phila., Pa.
- ☐ Copper Napthenate, 28,212 lbs., 8% solution, in drums, Cleveland, Ohio, price $.12 per lb.
- ☐ Copper Napthenate, 22,220 lbs., 8% solution, in drums, Nashville, Tennessee, price $.12 per lb.
- ☐ Copper Napthenate, 10,037 lbs., 8% solution, metal drums, Charlotte, N. Carolina, price $.12 per lb.
- ☐ Copper Napthenate, 6,613 lbs., 8% solution, in drums, Birmingham, Ala., price $.12 per lb.
- ☐ Sodium Sulphite, 492,000 lbs., 100-lb. bags, Nashville, Tenn., price $30.00 per ton.
- ☐ Manganous Chloride, 100 short tons, in bulk, Salt Lake City, Utah, price $50.00 per ton.

Firm .....

Street .....

City ..... State .....

(155-1)

Contact your nearest RFC Agency Office listed below for information, regarding *all* surplus materials. If your local RFC office does not have all the materials you need, it will endeavor to locate them from other offices throughout the country.

PAINTS

PROTEIN BINDER COLD WATER CAMOUFLAGE PAINT, TYPE I

Specification: ES-T-1093
Colors: Burnt Sienna, Burnt Umber, Deep Green, Blue, Chrome Oxide Green, Iron Oxide Red, Earth Red
Packed in 5 pound cartons
Richmond, Virginia
Price: 2¢ per pound

OLEORESINOUS (EMULSIFIABLE) CAMOUFLAGE PAINT
Specification: T-1279
Color: Olive Drab
Packed in 5 gallon containers
San Francisco, California
Price: 65¢ per gallon
Minimum sale: 200 gallons

OIL TYPE READY MIXED CAMOUFLAGE PAINT
Specification: T-1215
Colors: Olive Drab, Loam, Earth Brown, Field Drab, Earth Red, Dark Green
Packed mostly in 5 gallon containers
San Francisco, California
Price: 65¢ per gallon
Minimum sale: 200 gallons of any one color

CAMOUFLAGE LACQUER
Specification: M-485 & M-485 C. Colors: Light Gray & Blue Gray
Packed in 5 gallon containers
Philadelphia, Penna.
Price: 50¢ per gallon

LACQUER DOPE
Specification: 3-109-E
Color: Olive Drab
Packed in 30 gallon drums
Chicago, Illinois
Price: 50¢ per gallon

A DISPOSAL AGENCY DESIGNATED BY THE SURPLUS PROPERTY ADMINISTRATION for Surplus Producers' and Capital Goods, Aircraft and Plants formerly handled by Reconstruction Finance Corporation . . . and for Surplus Consumer Goods formerly handled by United States Department of Commerce.

WAR ASSETS CORPORATION

(A SUBSIDIARY OF RECONSTRUCTION FINANCE CORPORATION)

RFC OFFICES (INCLUDING FORMER DEPARTMENT OF COMMERCE REGIONAL SURPLUS PROPERTY OFFICES) LOCATED AT: Atlanta • Boston • Chicago • Denver • Kansas City, Mo. • New York • Philadelphia • San Francisco • Seattle • OTHER RFC SURPLUS PROPERTY OFFICES LOCATED AT: Birmingham • Charlotte • Cleveland • Dallas • Detroit • Helena • Houston • Jacksonville • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • Oklahoma City • Omaha • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • Spokane • OTHER FORMER DEPARTMENT OF COMMERCE REGIONAL SURPLUS PROPERTY OFFICES LOCATED AT: Cincinnati and Fort Worth

Yours for the Asking

Faster fulling and scouring
Maximum grease and soil removal
A truly fine hand
Lower operating costs

NAMICO "C"

A pure, low titre soap that has proved so satisfactory for the processing of many fabrics, yarns and fibers.

DON'T HIDE A FINE FABRIC UNDER A POOR FINISH

SINCE NAMICO 1896

NATIONAL MILLING and CHEMICAL CO.
4601 Nixon St., Philadelphia 27, Penna.

QUALITY RICHMOND PRODUCTS

NYLTEX

For Knitting

NYLON

Use in trough

Keeps Needles, Sinkers, and Machines Clean
Does Not Strip Size

Send for FREE Sample

NYLTEX

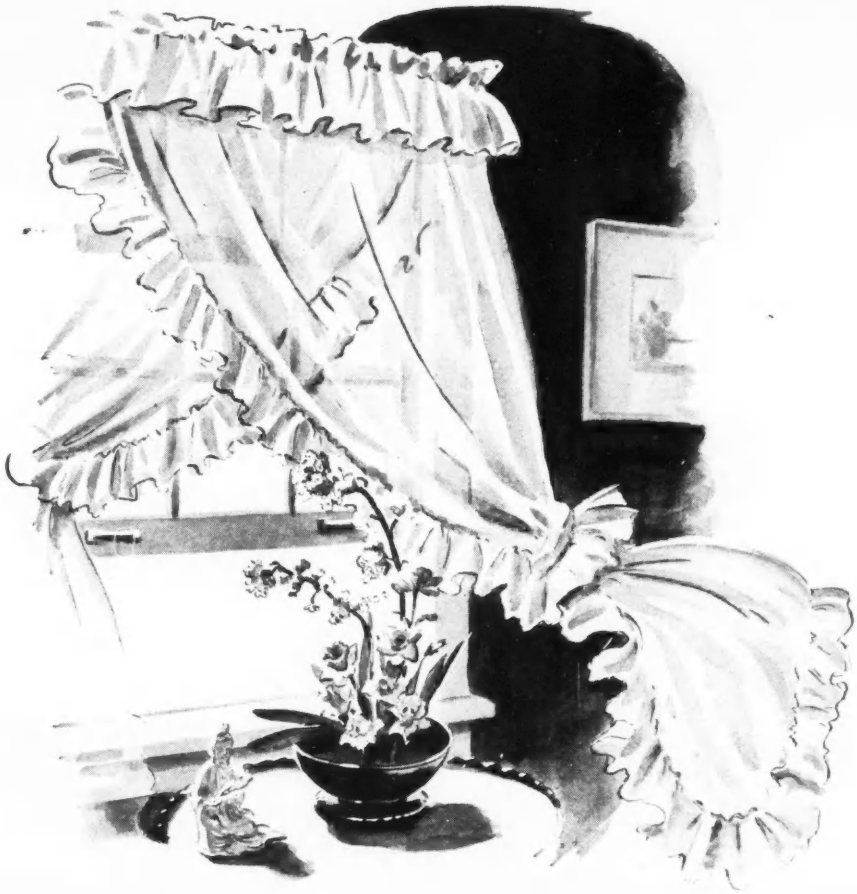
RICHMOND OIL, SOAP & CHEMICAL CO., Inc.
1011-43 FRANKFORD AVE., PHILADELPHIA 25, PA.

RAPIDASE

for de-sizing cottons, rayons and mixed goods

Assures rapid, dependable de-sizing
Our technical staff always at your service.

WALLERSTEIN COMPANY, INC.
180 MADISON AVENUE • NEW YORK



Customers find curtains stay flower-fresh longer if they're protected with DRAX

Trademark Reg. U.S. Pat. Off.

Sudden showers and dusty breezes don't worry DRAX-treated curtains. Their invisible wax finish protects them from rain and dirt. Curtains stay clean longer . . . so they stay *up* longer . . . need less frequent washings so they *last* longer! All these are benefits customers really appreciate.

You'll find that DRAX gives superior results in use. Tests conducted by an independent laboratory showed that DRAX produced a water-repellency exceeding Army specifications for initial spray rating. It is easy and inexpensive to use and may be applied, not only to cellulose fibres, but to *any* textile.

DRAX is made by the makers of Johnson's Wax. Technically, it is a simple wax emulsion, non-flammable, stays stable in solution. Textile mills already using it find that DRAX adds a profit-plus to the fabric without being difficult or expensive to use. It will pay you to find out about DRAX now.

S. C. JOHNSON & SON, Inc.

Fabric Finishes Division, Racine, Wisconsin
Starrett Lehigh Bldg., 601 W. 26th St., New York 1
Or any of our other 18 district offices
Also S. C. Johnson & Son, Ltd., Brantford, Ont., Can.

This DRAX tag is a sign of plus *value!*

DRAX is made by the makers of Johnson's Wax (a name everyone knows)

FLOOD WATER? Micromax Controls May Help Solve pH Problems

When a river is contaminated by flood or chemical waste, or when anything else happens to upset the pH of a plant's raw-water supply, many mills find that Micromax pH Controllers are a big help in keeping the upset from reaching their finished water.

For, in an emergency as at all other times, a Micromax can step the amount of chemical either up or down, to the limit of the valve or feeder capacity, and still hold the chemical in strict, constantly-proportioned balance with the condition of the water being treated. It frees the water plant from an enormous amount of manual work, and at the same time gives the manufacturing departments a clear well of far more uniform water than most operators can supply under manual control. And Micromax saves chemical because it ends over-treatment.

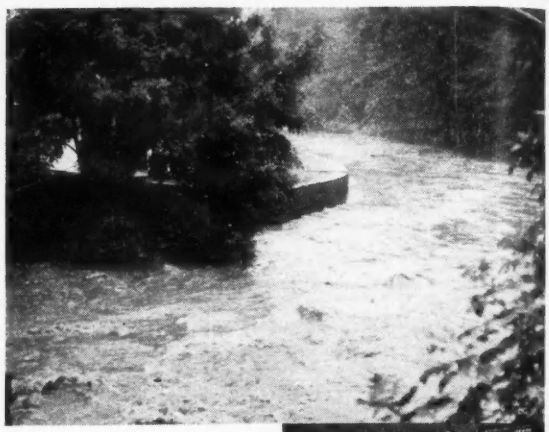
Micromax pH Controllers can be applied at the desired point in practically any water-treating cycle. An L&N engineer will be glad to supply technical information.

LEEDS & NORTHRUP COMPANY, 4965 STENTON AVE., PHILA. 44, PA.

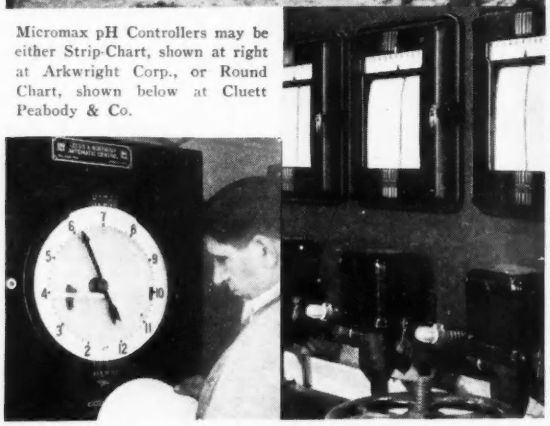
LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

Jrl Ad. N-96(4a)



Micromax pH Controllers may be either Strip-Chart, shown at right at Arkwright Corp., or Round Chart, shown below at Cluett Peabody & Co.



NUODEX

MILDEW-PROOFING AGENTS

Copper, Zinc and Mercury Naphthenates — meeting all Government specifications—available in various concentrated forms for use in solvents or emulsions. Write for samples and use information.

THREE LITTLE BOTTLES THAT BUILT THE PLANT

NUODEX PRODUCTS CO., INC.
ELIZABETH, F, N. J.
NUODEX PRODUCTS OF CANADA, LTD., LEASIDE, ONT.

DYER WANTED:

Man who is experienced in the application of all types of dyestuffs on cottons. Piece goods experience is desirable, but not essential. This is a wonderful opportunity to work into a splendid position. Excellent opportunity for advancement. Ideal working conditions in modern, well-equipped plant. Write fully giving background and experience. All correspondence will be treated confidentially.

WRITE PERSONNEL DEPARTMENT

AMERICAN FINISHING COMPANY

Memphis, Tenn.

RAYONS
FULLY-WASHABLE... SHRINKPROOF

NOW YOU CAN BUY THIS DREAM...
COURTESY
DEFINIZED
TRADEMARK

FOR YEARS the Textile Industry has dreamed of economically controlling residual shrinkage of Rayon fabrics; of making Rayon fabrics fully washable.

DEFINIZED Rayon makes this dream an easy actuality for the entire industry.

DEFINIZED is a wholly physical action which can be swiftly and simply applied to the goods in the GREY, without special machinery or resins and at a cost far under that of any other method now available.

DEFINIZED Rayon Shrinkage Control means:

1. Shrinkage control (less than 1%).
2. Stretching control (less than 1%).
3. No chlorine retention in laundry.
4. No loss in tensile strength.
5. Heightened brilliance of white grounds.
6. Higher color value with a consequent saving in dyestuffs.
7. No loss in abrasion resistance.
8. Printing — at last, perfectly faithful reproduction of design in both line and color.

DEFINIZED Rayon fabrics have sailed through all tests, laboratory and actual mill production, with colors flying.

DEFINIZED
TRADEMARK
(Controlled Shrinkage)

IS A LICENSED PROCESS

ALROSE CHEMICAL CO.
PROVIDENCE, RHODE ISLAND
PHONE WILLIAMS 3000

Aqua-Sec Corporation, New York—Selling Agents

ASK FOR A DEFINIZED DEMONSTRATION *NOW*
FILL IN AND RETURN THE COUPON BELOW

Gentlemen:

I am interested in the **DEFINIZED** Rayon process, please arrange for a demonstration appointment.

Plant.....

Address.....

Sender..... *Title*.....

Remarks.....

PIONEERS

IN THE APPLICATION OF

INFRA-RED RADIANT HEAT

IN THE

Textile Industry

CARBOMATIC INFRA-RED GAS OR ELECTRIC UNITS

- Drying
- Curing
- Carbonizing
- Singeing

PRODUCING

- Greater Speed
- Greater Accuracy of Control
- Increased Production
- Greater Uniformity
- Free from Torching

Our engineering department will gladly show you how Carbomatic will improve your production without any obligation.

All equipment guaranteed and in conformity with insurance companies' requirements.

Carbomatic gas burning, ceramic reflector producing electro-magnetic infra-red waves.

65% OF OUR ORDERS ARE *Repeats!*

Carbomatic Singeing Unit in Operation

SEND FOR FOLDER DR-2

INFRA-RED DIVISION

CARBOMATIC CORPORATION

117 WEST 63rd STREET • NEW YORK 23, N. Y.

Also—H. W. Butterworth & Sons Co., Philadelphia, Pa.
In Canada—Canadian Textile Engrg. Ltd.
980 St. Antoine Street, Montreal, P. Q.

LeaTex

The name that means leadership in

CHEMICAL SPECIALTIES

for the

TEXTILE INDUSTRY

"Always Reliable"

LEATEX CHEMICAL COMPANY
2722 N. HANCOCK ST., PHILADELPHIA, PA.

BURKOL

SYNTHETIC DETERGENT

BURKOL is a true detergent. That is, it possesses scouring and cleansing power to a marked degree, whereas the majority of the so-called synthetic organic detergents are primarily wetting agents.

BURKOL is economical to use, because it is low in cost and but a little is required for effective results. It is well suited for scouring and boiling off all types of textiles, including raw stock, yarns, hosiery, and fabrics. **BURKOL** may be applied in hard or soft water.

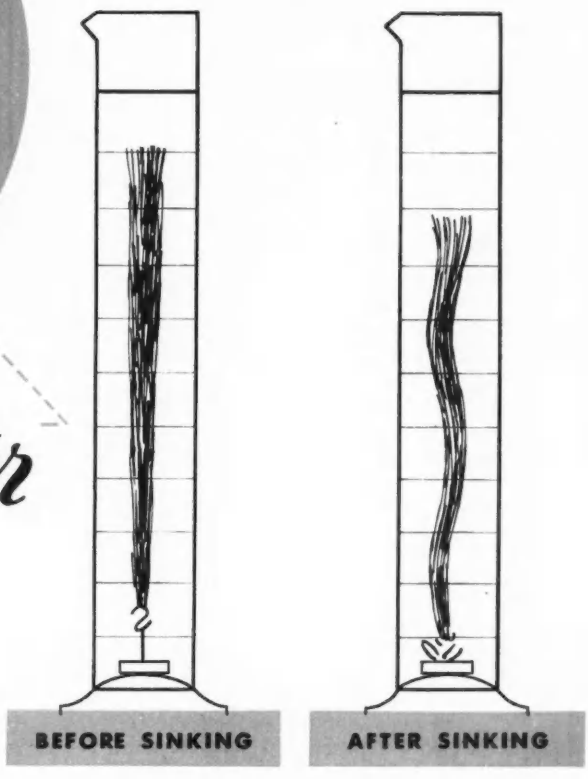
Goods scoured with **BURKOL** acquire a pleasing soft finish, which is well-retained through subsequent dyeing operations, so that usually no further finishing is required.

BURKART-SCHIER CHEMICAL CO.
CHATTANOOGA, TENNESSEE

MANUFACTURING CHEMISTS FOR THE TEXTILE INDUSTRY

THE NEW AHCOWET RS

it's 25% faster



HAS 100% MORE LIME STABILITY

AHCOWET RS was such an outstanding wetting agent in the beginning that there seemed little opportunity for improvement. However, our laboratory has accomplished the "impossible", coming up with a product that is 25% more effective as a wetting agent and which has 100% greater lime stability. To the best of our knowledge this new product is unequalled from an economy or a quality standpoint.

OTHER PROPERTIES. Ahcowet RS is also an excellent softener and an all-purpose penetrant, having a pH range of 1 to 11. In the presence of strong acids up to 2% concentration, it wets instantly and concentrations of calcium and magnesium salts up to 700-750 parts per million have no effect on its wetting efficiency. It should not be used in alkaline baths above a pH of 11.

APPLICATION. Ahcowet RS is excellent for use in dye baths, in sanforizing and in all types of finishing where a wetting agent is required under neutral or acid conditions, or where the concentration of caustic soda does not exceed .05%.

Send for a free sample today.

ARNOLD-HOFFMAN & CO., INC.

MANUFACTURING CHEMISTS

ESTABLISHED 1815 — PLANTS AT DIGHTON, MASS. AND CHARLOTTE, N. C.

PROVIDENCE, RHODE ISLAND

NEW YORK BOSTON PHILADELPHIA CHARLOTTE

PLURAMINE AH 100%

A HIGHLY CONCENTRATED TEXTILE SOFTENER FOR CLOTH FINISHING.

SOFT VELVETY FINISH FOR COTTON, LINEN, VISCOSE AND CELLULOSE ACETATE, AND RAYON.

•

Ask for descriptive literature.

•

KEARNY MANUFACTURING CO., Inc.

KEARNY, N. J. KMC GREENVILLE, S. C.

MONTREAL MEXICO SAO PAULO BUENOS AIRES ANTWERP

WANTED:
RESEARCH CHEMIST:

To have charge of research laboratory in large textile print plant located in the south. Thorough chemical training essential also fundamental knowledge of Resins and Related products. Practical experience in printing and dyeing of textiles preferable but not absolutely necessary. Must have ability to create and develop ideas. This is an excellent opportunity for the right man. Salary commensurate with qualifications. State age, education, experience and references. Write Box 819.

Have you ordered a Binder for your Reporter copies?

Maroon leatherette, gold lettered, large enough to hold twenty-six issues, only $2.50 post-paid.

Please send check with order to:

AMERICAN DYESTUFF REPORTER
One Madison Avenue
New York 10, N. Y.

POSITION AVAILABLE for college graduate with chemical degree, familiar with textile processes and utilization of textile treating agents. In reply please provide complete details concerning education, experience, personal data, salary desired, and recent photograph. Those not qualified, please do not apply.

Director of Industrial Relations
Emery Industries, Inc.,
4206 Carew Tower,
Cincinnati 2, Ohio.

GLUE - GELATINE

DEXTRINE

GUM

STARCH

SIZING MATERIALS

FINISHING PRODUCTS

CHAS. S. TANNER COMPANY

EXTENDS TO YOU A CORDIAL
INVITATION TO VISIT US DURING
OUR *eightieth* ANNIVERSARY
YEAR.

★

PROVIDENCE 1866-1946

ADHESIVES

5 WAYS TO SPEED YOUR
NYLON
HOSIERY PROCESSING
Maintain smooth production flow — Improve hosiery quality

- **LAUREL Coning Oil #443 for better conditioning**
- **LAUREL Nynit C for better knitting**
- **LAUREL Supergel for cleaner hosiery**
- **LAUREZOL #6 for level shades**
- **LAUREL Peramel for fine appearance, lasting finish**

These **5** LAUREL NYLON Hosiery Processing Agents will enable you to speed up adequate stocks for your share of the tremendous demand for Nylon hosiery.

LAUREL NYLON Hosiery Processing Agents give you a hard-to-beat combination: **1.** an excellent conditioner, makes for better knitting; **2.** an effective lubricator, prevents sticking in pre-boarding operation; **3.** a thorough scour, leaves hosiery clean, ready for dyebath; **4.** an active dispersing agent, has greater penetration, produces level shades; **5.** a lasting finish, adds to the beauty and appeal of your hosiery.

Tested and used pre-war by well-known mills and dyehouses, LAUREL NYLON Hosiery Processing Agents will give you a head start. Phone, wire or write today for trial order and directions for use.

• SOAPS • OILS • FINISHES •

LAUREL SOAP MANUFACTURING CO., Inc.

Wm. H. Bertolet's Sons • *Established 1909*

WAREHOUSES—PATERSON, N. J. • CHATTANOOGA, TENN. • CHARLOTTE, N. C.

OFFICE—2601 East Tioga Street, Philadelphia 34, Pa.

How Much Sunlight Will Your Colored Fabrics Stand?

The EPLAB PYRHELIOMETER Will Tell You, By Accurately Measuring SOLAR RADIATION

ARTIFICIAL light tests will give you comparative information about the light fastness of your colors, but they will NOT tell you how much sunlight your colors will stand, without fading, whether in California, Florida or Maine.

The Eppley Pyrheliometer, used in conjunction with the correct potentiometric recorder, gives you this information, furnishing a complete, accurate and reliable record of the amount of solar radiation received each day at any particular spot. It is for obtaining such records that the EPLAB PYRHELIOMETER is used at fourteen out of eighteen weather stations in the United States, nine of which stations are under the direction of the United States Weather Bureau.

Be prepared to sell the quality of your colors. Use the Eplab Pyrheliometer to get accurate, complete information regarding the actual amount of sunlight they can "take."

Bulletin No. 2-A On Request

EPLAB

THE EPPLEY LABORATORY, INC.

Scientific Instruments

Newport, Rhode Island, U. S. A.

10 PRODUCTS of Proven Dependability

WHICH SHOULD WARRANT ★ YOUR ATTENTION ★

***AQUAROL :** A water repellent for processing woolen, cotton and rayon fabrics, also produces excellent results in splashproofing or finishing all types of hosiery.

***PARAMINE S :** A cation active softener for processing cotton and rayon cloth to obtain a soft, smooth, pleasing finish.

***ALGEPON S :** An assistant in dyeing vat colors to prevent premature oxidation of the reduced bath and eliminate uneven dyeings.

***ALGEPON V A :** Assistant for stripping vat colors—complete reduction of color in stripping bath providing lighter bottom for redyeing.

***PARAPON S A :** A highly efficient leveler and softener for dyeing and finishing all types of yarn, cloth and hosiery to produce a uniform dyeing and a soft full hand.

***ARIPEL F S :** Finish and gas inhibitor for processing dyed acetate rayon—produces a soft full feeling finish and prevents gas fading of the color.

***LANITOL F :** A synthetic detergent possessing exceptional scouring and washing properties for processing wool, cotton, rayon or nylon.

***CULOFIX :** Used as an after treatment in last rinse to prevent bleeding of direct dyed cotton or rayon in water.

***DIAZONOL A C :** For boiling out cotton cloth in pressure or open kiers to produce greater absorbency and cleaner material. Excellent for preboiling knitted cloth in preparation for chlorine bleach. Also used with good results for boiling out cotton or rayon cloth on the jig.

***TETRANOL 1638 :** A rapid wetting and penetrating agent. Active in acid, alkaline and salt solutions and not affected by hard water, may be used in all types of dyeing operations to insure positive penetration of color and a uniform and solid shade.

And a Complete Line of Oils, Chemicals, Softeners and Finishes For Wet Processing All Textile Fibres

*Reg. U.S. Pat. Off.

ARKANSAS CO. Inc.

Newark, New Jersey

ESTABLISHED OVER 40 YEARS

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